EDUCATIONAL PROGRAMS 1963

MISSOURI BOTANICAL GARDEN

ACTIVITIES FOR CHILDREN

SATURDAY NATURE PROGRAMS FOR CHILDREN

NATURE study programs are provided every morning from 10 to 11:30 A. M. in the Museum Building and greenhouses for children ages 7 to 16. The programs are free and no advance registration is required.

Children are given instruction in the world of plants and their association with man, animals, birds and insects. They are encouraged to make collections. They plant seeds and bulbs, make cuttings of plants, and work in their own outdoor flower and vegetable plots. These programs offer children action, recreation, and the fun of taking home their collections, seedlings, bulbs, and produce from the garden plots.

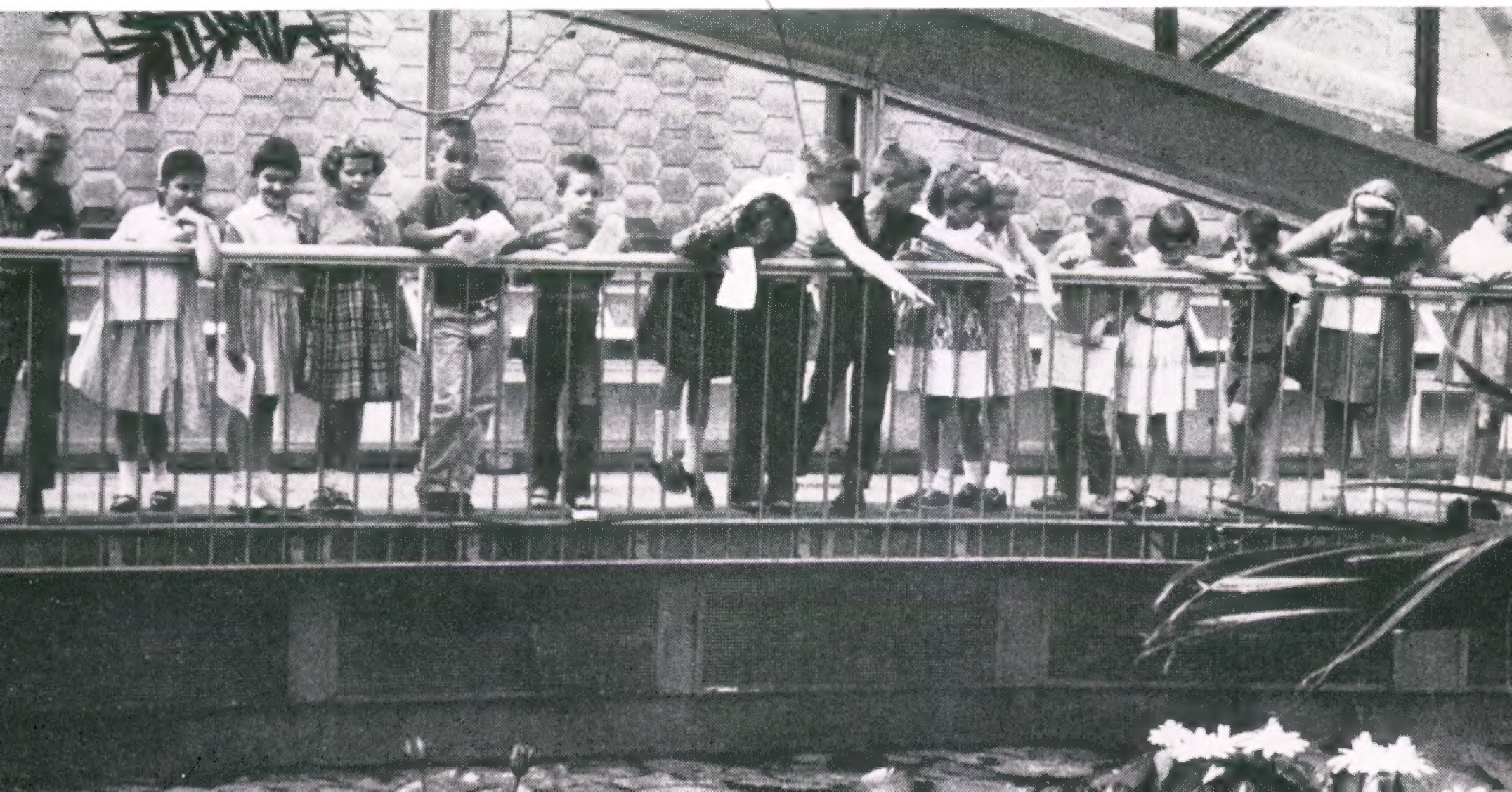
For more information, call TO 5-0440.

PITZMAN SUMMER NATURE STUDY COURSES

A free summer nature program for children between the ages of 7 and 16 is made possible by a grant from the Pitzman Foundation. Children have a fundamental curiosity about everything going on around them, and these summer courses encourage this interest in living things by bringing children into closer contact with nature and answering the many questions that arise from such an experience.

The program is held on Tuesdays and Thursdays from 10 A. M. to 3 P. M. for 2 sessions of 5 weeks each. Junior and Senior Research Teams comprised of children interested in doing special natural science projects will meet on Wednesdays and Fridays under the direction of the Garden staff.

Registration for the first session will begin June 1st and for the second session July 1st. For information about the courses and registration, visit the Main Gate Office or telephone TO 5-0440.



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MISSOURI BOTANICAL GARDEN BULLETIN

Volumes 50 - 51   1962 - 1963

MISSOURI BOTANICAL GARDEN

Bulletin

January 1962
Volume L
Number 1

COVER: Cyperus Papyrus. Growing in Victoria Lake in the Climatron. This plant is a native in Palestine and along the Nile River in Egypt. It is the plant from which the ancients made paper. Papyrus is not hardy in our area but can be grown in pools or in wet swampy places outside during the summer months. PHOTO E.L.E.

CONTENTS

Rain Forests of Colombia

Small Flowering Trees

The Tree of Heaven — *Ailanthus altissima*

Another for the List of Mole Cures

Rabbit Repellents

Book Reviews

Friends of the Garden Notes

Garden Educational Programs for 1962

New hours were recently announced for Tower Grove House. It will be open every day from 10:00 A. M. to 4:00 P. M. in winter, from 9:00 A. M. to 5:00 P. M. in summer.

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Volume L No. 1 January 1962

RAIN FORESTS IN COLOMBIA

LADISLAUS CUTAK

MARSTON BATES, son-in-law of the late David Fairchild and a scientist in his own right, once wrote that "there are a few world landscapes left upon which man, the perennial changer, has had no effect." He cited the Arctic tundra, the Sahara Desert, and that perpetual wonder, the Amazonian rain forest. I have had no opportunities to visit the first two areas, but a year ago I returned from a six-weeks journey to the latter where I found first-hand proof that Dr. Bates was correct in his statement. This most enlightening trip was made possible by the generosity of Johnnie Garretson, an employee of the Colombian Petroleum Company, and the Missouri Botanical Garden. Dr. Frits Went, the Garden director, and the Board of Trustees should share the spotlight for they both enthusiastically approved this plant expedition and lent moral as well as financial support for the venture.

In these modern times, man has been able to push the sea back, to change the course of rivers, build artificial islands, level hillsides and mountains, but as yet he has not been able to touch the Amazonian rain forest. Here, no alteration has been made, and giant trees, exquisite flowers, and various voracious insects still rule. In the words of Dr. Marston Bates, "man in the rain forest is just another rather simple animal walking quietly and apprehensively."

The tropical rain forest in South America occupies a vast area. It spreads from Venezuela and Colombia through many areas of Brazil into Bolivia. In Colombia it occupies roughly many of the mountain valleys of the Andean region and stretches into the vast savannah country towards Brazil. There are three distinct mountain ranges in Colombia which gradually converge near the Ecuadorean border and form one massive chain that extends all the way down to Patagonia. High rainfall prevails and is spread fairly evenly throughout the year. In some sections, like the Junin area, on the Pacific side, the rainfall is exceptionally heavy every day of the year. In the forests one will see various kinds of plant growth: creepers, terrestrials, epiphytes, lianas, bushes, shrubs and giant trees. You will never see continuous forests of specific plants as you would in the United States. No pine forests, no fir forests, no oak forests, or no single kind of plant is overwhelmingly abundant. The Colombian woods abound in diverse plants, each one striving for survival. Giant trees rise heavenward, some with great buttressed trunks, presenting a cathedral-like atmosphere; others unbranched until the very top where they spread their leafy canopy and shut out light. Sometimes the forest floor is fairly open, especially where the dense crowns of big trees cut out so much light; then again the ground in the forest is literally covered with creeping plants, vines, and herbaceous growth.

My first introduction to the Colombian forests was from the air. Johnnie Garretson and I boarded a Colpet plane at Barranquilla and in less than an hour, flying southeastward, we flew over the hump of the Cordillera Oriental, heading for Tibu, on the Venezuelan border. Tibu is the headquarters for the Colombian Petroleum Company which employs my friend. As we flew over the Serrania de los Motilones, Garretson drew my attention to the dense forests clothing the mountain slopes and an occasional clearing where the 'malocas' of the savage Motilone Indians could be spotted. This tribe has lived in savage isolation in the mountainous jungle terrain along the Colombia-Venezuela border for more than four centuries. It is said that the Motilones fled to the nearly impenetrable mountain jungles to escape the cruelty of the 16th century gold-seeking conquistadors and that ever since they have fiercely resisted attempts to pacify them. When oil was discovered in the Lake Maracaibo basin in the 1920's, settlers have been pushing deeper into the Indians' territory and the latter, resisting encroachment, frequently made surprise attacks on isolated settler outposts. A

Rain Forest in the Catatumbo River drainage basin in Columbia. This forest is rich in interesting lianas, epiphytes and other tropical plants. PHOTO L.C.

week prior to my arrival in Tibu, one such attack was made on a Colpet truck making an inspection tour of the company pipeline, which extends through the Motilone country. A small party of the savages shot seven arrows into the truck but fortunately none of the occupants was hurt. I have one of the arrows for a souvenir. These primitive arrowheads are made from the black palm, which grows in the region, and are attached to bamboo shafts.

During my stay in Tibu, several collecting expeditions were made into the Catatumbo drainage area in the Motilone country. Río Tibu, a typical jungle stream bordered by dense vegetation, flows past the Garretson property and I was wont to plunge into the jungle on every occasion. Tall trees, dense shrubbery and huge lianas were evident everywhere. Anthuriums and bromeliads perched on the branches high above and the only way to secure them was to cut down the trees. You don't climb trees in the American tropics. First of all, the trunks tower upwards before the branching starts, and secondly, voracious ants are everywhere and most of them bite nastily. It is wise to be cautious of what you lean against or put your hand upon. Also frequently one comes upon columns of leaf-cutter ants, each carrying home parts of leaves from specially chosen trees. They bring the slices of green foliage to serve as fertilizer for their underground mushroom gardens. These ants are the worst kind of a plague, especially in gardens and on farms, for they do an enormous amount of damage. While on the subject of insects, one that gave me the most trouble in the hot, humid Tibu region was the *jejene*. These are so tiny that it is impossible to see them but the welts they produce burn like the devil. At first I blamed the mosquitoes for inflicting the many bites—and mosquitoes were plentiful—but after I found out the real culprit, I apologized to the mosquito. Insect repellents are of no use, for the perspiration reduces their efficacy.

Heliconias, gingers, ferns and many Melastomaceous and Acanthaceous plants were noticed. Calatheas reach up to ten feet in height and their broad leaves are used everywhere in Colombia for wrapping paper. Bundles of them are even sold in the markets. In another direction, following the Tibu river westward, we came to a waterfall, the first of hundreds that I was to see during my stay in Colombia. Under the constant spray grew colonies of Anthurium in profusion. A Spathiphyllum looked happy in the clayey soil beside a pool and everywhere on moist banks a grassy-leaved Pitcairnia with yellow and scarlet flowers could be noticed. A Cyclanthus, relative of the Panama Hat Palm, grew in small clusters.

Along one abandoned road the verdure was fast encroaching upon it and we had to leave our truck behind and continue on foot. After about an hour's walk we came to a second waterfall, discharging its waters into a gorge full of interesting plant life. In order to lower ourselves we had to cut down a medium-sized tree, make notches in the trunk for steps, and slide it down against the rocky wall.

Everything was dripping with moisture and the algae and mosses covering the rocks made them exceptionally slippery, so that extra caution had to be exercised before undertaking each step. Some unusual ferns, with iridescent hue, were spotted under a dripping overhang of rock and on the rock wall itself a Gesneriad with scarlet blooms grew in abundance. A tiny orchid with white flowers and very few leaves grew on the moist ground and keeping it company was a fragrant Spathiphyllum, identical with the one collected at the first waterfall. High above the boulder-strewn floor, in sheltered nooks and on rock-shelves, grew a leather-leaved *Anthurium ornatum,* some plants producing the characteristic white spathes. The clusters made a beautiful sight, but trying to collect specimens was another matter because of the slippery approaches. However, after some dexterous maneuvering by my guide, a few canes were procured. In appearance this Anthurium is similar in vegetative character to *A. andreanum* and its many hybrids but does not possess the rich colors in the inflorescences of the latter. A velvety-leaved philodendron hung from the ledges and even clambered over boulders while a Cyclanthus perched on the rocks spreading its roots over the moist surface. A Pitcairnia preferred the rocks also and clung so tightly that it was hard to dislodge. An examination of the trees growing in the gorge revealed very few epiphytes. Retracing our steps towards the truck, we paid particular attention to the strange flora lining the road.

First there was a small three-foot herb, probably *Tococa guianensis,* belonging to the Melostomaceae, which bears a peculiar little pouch or inflated organ at the base of each leaf. This species is one of the many myrmecophyllous plants which harbor stinging ants, so prevalent in the American tropics. When I made a few field trips in the arid coastal areas around Barranquilla I came across a viciously thorny shrub or small tree which likewise catered to the ants. This Acacia bore on its branches paired, hollow bull's-horn thorns which were inhabited by stinging ants. Cecropia trees are very common in Colombia, characterized by large peltate, many-lobed leaves, often conspicuously whitish or silvery on the undersides. They are weedy trees, of relatively fast growth, producing few candelabra-like branches which make them rather conspicuous in the second-growth thickets and along the margins of woodland. Their hollow trunks are usually inhabited by colonies of stinging ants. An Acanthaceous shrub, probably *Trichanthera gigantea,* appeared to be one of the showiest along the roadside, not only here but in many other places surrounding the Tibu area. The bright yellow and red flower clusters appeared all over the shrub and heightened its glory. Still another conspicuous bloomer was *Cephaelis tomentosa,* belonging to the Rubiaceae. At most, it is a subshrub with opposite leaves and mostly small flowers collected in an involucral head. The involucre is the showiest organ, being a vivid scarlet. The plant apparently is widespread for I saw it in many humid

PHOTO L.C.

Home of the *Anthurium ornatum* in Colombia. The moist boulders support a species of *Cyclanthus.*

regions throughout Colombia. The plant that took my fancy, however, was *Warscewiczia coccinea,* another Rubiac. It added a splash of brilliant red on well-drained clay ridges. At first glance it appears to be a Poinsettia, especially when seen from a distance, but on closer approach there is a difference and there is no milky juice in any of its parts. It can become a small tree with small orange flowers produced in elongated terminal panicles of many small, dense cymes, each cyme provided with an elongate, blood-red petal-like lobe, which gives it the Poinsettia look.

A tree which intrigued me most was a Melastom, *Bel'ucia grossularioides,* which produces relatively large cream-colored succulent blossoms, in age turning brownish. A magnificent specimen grows in Garretson's yard and spreads its leafy canopy over a wide area. In the wild I spotted a few trees along the river bank at higher levels. Another tree that caught my eye was a large-leaved fig, probably *Ficus gigantea.* It gave me the impression of *Ficus pseudopalma* from the Philippines, which is one of the rarities cultivated in the Climatron. Small specimens, 10 to 15 feet tall, look very impressive, especially when the extra long, wavy-margined, bright green leaves extend in columnar fashion all the way down. Strange enough, most of the above plants, as far as I know, are not found in cultivation but should rightly find a place in all botanic gardens. What the reason for their absence is, I don't know, unless it be that they are difficult to handle. I took a number of cuttings for trial but failed to root them. I'm sure the time factor plus some unforeseen problems have caused their demise. An attempt will be made to secure fresh starts from Garretson.

A most exciting trip was undertaken to a wild region, above Las Mercedes, which is not even listed on any map. We had tried to reach this place two weeks before but were turned back due to the very muddy and impassable condition of the road. From the start, the road was in fairly good shape but progressively got worse in the mountains. The road has not been maintained since it was abandoned by Colpet in 1956. I predict that in another four years there will not be any semblance of a road left, at least for vehicular traffic, unless repairs are made immediately. Erosion is slowly destroying the road in many places and in others vegetation is swallowing up sections. The road runs along a crest and often it is so narrow that awesome declivities can be seen on both sides. The ascents are quite steep, too. At any rate the ride shakes one up quite a bit and prematurely greys your hair. After negotiating about 50 miles we entered a jungle with giant buttressed trees loaded with epiphytes. Even before plunging into the thick jungle we came upon a bromeliad, *Guzmania musaica* and its variety, *zebrina,* which can now be included in Colombia's flora. The variety was described by me (M.B.G. Bull.—April 1950) from plants collected in Panama by Paul Allen and no record of it has been mentioned for Colombia until our visit. Both the species and the variety are here by the thousands. This is one of the showiest of bromeliads, both in and out of flower. The plant makes a spreading rosette with leaves marked by heavy crossbands in zebra-like fashion. From the center issues an inflorescence with orange-red bracts and golden yellow flowers tipped white. The plants grew on the ground, as well as on the lower portions of tree trunks, and even perched on the branches. Another bromeliad, *Tillandsia monstrum,* was also evident at the bases of trees, producing long flattened inflorescences that appeared fringed at the top. Along a murky stream an iridescent Selaginella was covering the bank and the forest floor was particularly overgrown with a pretty 'Christmas-tree' Lycopodium. Tree ferns were present, some Anthuriums, a Peperomia, and a Philodendron. Since it was getting late in the day and rain clouds were forming in the distance, we decided to curtail our collecting and head for home. To get stuck in this region for the night would have been disastrous.

This story of the rain forests could be continued further but let it serve its purpose for the time being and whet the reader's appetite for more to come.

SMALL FLOWERING TREES

P. A. KOHL

In recent years many new homes have been built, most of them by real estate developers. Houses are planned and built according to specifications but seldom are the areas surrounding the buildings improved with trees or shrubs. When people buy a house and move in they soon realize how bare it looks without any plants. The contrast between an established neighborhood and the bareness of a new subdivision is extreme. It's the lack of trees, shrubs and particularly evergreens that makes the difference.

Many people who move to the suburbs have never gardened and know little about plants. They have an urge to improve the appearance of their homes but are confronted with the problems of selecting the right plants, locating them properly and planting and caring for them. Much information may be obtained from garden and home magazines and books and from an experienced nurseryman who will help his customers in the selection of plants. Home owners discover that gardening is a rewarding experience and soon acquire a great deal of knowledge about plants.

Since trees are so important, they should be chosen wisely and for a definite purpose. Small trees enhance the appearance of modern homes and large trees shade the gardens and houses. There are numerous small and medium-sized flowering trees which bloom in this area in March and April before the leaves appear. One of these is the cornelian cherry which usually blooms in March. It grows into a large, round shrub, ten feet high and is covered for two or more weeks with a mass of small, yellow flowers. It and forsythia are the first yellow shrubs to bloom.

The saucer magnolia, *Magnolia soulangeana,* is frequently seen in old gardens as a broad, low-branched tree about fifteen feet tall. In early April, with its large pink and white blossoms, it is by far the most conspicuous flowering tree. It grows well in almost any location and soil and seldom needs any attention. Not all magnolias are from the original hybrid, made by a French army officer in the early

Saucer Magnolia, *Magnolia soulangiana*
PHOTO P.A.K.

nineteenth century. Other hybrids between *Magnolia denudata* and *M. lilliflora* have undoubtedly been made which accounts for the variation in time of flowering of different plants. April is the month of small flowering trees. Various kinds of cherries bloom early in the month and by mid-April peaches and crabapples join the group. Not to be forgotten are our native redbud and dogwood trees which usually are at their best in the latter part of April. The white-flowered Fugi cherry, *Prunus incisa,* blooms in early April. The autumn Higan cherry, *Prunus subhirtella autumnalis*, bears semi-double, light pink flowers which last for more than a week. The tree is vase-shaped and grows from twelve to fifteen feet in height. The name would indicate that the tree also blooms in autumn but it has never done so here. We have often seen pictures of the cherry trees blooming around the Tidal Basin in Washington. Most of those trees are the Yoshino cherry. In St. Louis this species blooms in mid-April, when the tree is completely covered with white blossoms. The pink, double-flowered Kwanzan cherry is a beautiful tree. It cannot, however, be classed as a permanent tree and might have to be replaced after ten or more years. Double-flowering peaches also bloom in mid-April and named varieties in white, pink and red are available. These trees have a distinct trunk and resemble the fruiting peach trees in size and shape.

Numerous varieties of flowering

Yoshino Cherry, *Prunus yedoensis*, one of the finest of the flowering cherries. PHOTO P.A.K

crabapples have become popular in recent years. Some are small, like the Sargent crab, and others are broad like the carmine and Lemoine purple crabapples. The flowers, which are white, various shades of pink and red-purple, are followed by yellow or red fruits of various sizes. Crabapples are some of the best small-flowering trees.

The native redbud is an excellent tree. When it grows naturally it frequently branches at the base, but by pruning it to a single trunk it will develop into a fine small tree. The flowers are not red, as the name implies, but pink with a tinge of magenta. Planted alone or combined with its white-flowered variety it is an excellent tree for any garden. The flowers of *Cercis canadensis alba* are of the purest white. Many people do not know that there is a white form of redbud but once they see it they will be interested in planting it in their gardens.

Besides our prize native tree, the white-flowering dogwood, there are also pink and red varieties. In the country it is usually found growing at the edge of the woods or mixed with other trees. It will grow in the open but must be watered during dry periods for several years. Of all of the trees described thus far, dogwood requires the most care until it is established.

About a dozen small trees have been suggested for planting near a modern house. In selecting a tree for a particular location its ultimate size must be considered. A carmine crabapple four feet high and two feet wide when planted will, in ten years, be twelve or more feet broad and ten feet high. When purchasing trees, the larger sizes should be selected. The hole should always be dug large enough so that the tree can be planted without crowding the roots. A generous amount of humus in the form of leafmold or peat moss, mixed with the soil as it is packed around the roots, will benefit a tree. In the process of filling, the soil is firmed and water is added before the hole is full. Sometime later or the next day the remaining soil is placed around the tree. A tree ten or more feet tall will need to be staked or braced.

This is not a complete list of small trees but the ones that are described are March or April flowering. Some of the trees which bloom later are the fringe tree, hawthorne, sweet bay and bull bay magnolias, the goldenrain and pagoda trees.

A cross index of common and botanical names of the trees mentioned follows:

Common Name	Botanical Name
Bull bay magnolia	*Magnolia grandiflora*
Carmine crabapple	*Malus atrosanguinea*
Cornelian cherry	*Cornus mas*
Double-flowering peach	*Prunus persica*, var.
Flowering dogwood	*Cornus florida*
Fringe-tree	*Chioanthus virginica*
Fugi cherry	*Prunus incisa*
Golden-bells	*Forsythia* species
Goldenrain-tree	*Koelreuteria paniculata*
Hawthorne	*Crataegus* species
Higan cherry, autumn	*Prunus subhirtella autumnalis*
Japanese pagoda tree	*Sophora japonica*
Kwanzan cherry	*Prunus serrulata*, var.
Lemoine purple crabapple	*Malus purpurea lemoinei*
Lily magnolia	*Magnolia liliflora*
Redbud	*Cercis canadensis*
Sargent crabapple	*Malus sargenti*
Saucer magnolia	*Magnolia soulangeana*
Sweet bay magnolia	*Magnolia virginiana*
White redbud	*Cercis canadensis alba*
Yoshino cherry	*Prunus yedoensis*
Yulan magnolia	*Magnolia denudata*

THE TREE OF HEAVEN, *AILANTHUS ALTISSIMA*

II. Henry Shaw's Connection with Its Introduction

Mr. Shaw had a slight personal contact with the introduction of this Chinese tree into western horticulture. It was first raised in western Europe by Peter Collinson, who in 1751 planted seeds sent him from Nanking, China, in his remarkable garden at Mill Hill, just north of London. A half century later this estate had become the property of the Mill Hill School and Henry Shaw was a student there. There is a tradition at the school that he acquired his first interest in Natural History, living, studying, and playing in the shade of some of the fine old specimens from the Collinson collections. In those days the Collinson Ailanthus would still have been a rarity, of growing interest for its commercial and ornamental possibilities. As a school boy, Henry Shaw was probably acquainted with this first tree of Ailanthus in western Europe. E. A.

ANOTHER FOR THE LIST OF MOLE CURES

In the August 1958 issue of the American Horticultural Society *Gardeners Forum* there was an article, "Make War on the Pesky Moles." Some remedies were given such as Dieldrin, Chlordane, trapping, etc., but the method used by many of us was not mentioned.

This is the planting of *Euphorbia lathyrus* in various spots in the garden. It is a hardy biennial, (seeds itself) grows to about two feet in height, bears long narrow blue green symmetrically arranged leaves. It has been recommended highly as a repellent, and it was stated that moles would not go within sixty feet of it as the roots are alleged to give off a toxic secretion. The plant is decorative and I have planted and seen it planted among many kinds of plants. I have had no trouble with moles since having this Euphorbia in my garden, but did find two dead moles. A friend stated that she found seven dead moles. At least a half dozen gardens where *Euphorbia lathyrus* is planted among perennial plants report they now have no trouble with moles. The American Horticultural Society free seed program this fall will include seeds of this plant so everyone bothered by moles and wishing to try this method can "for free." Grace Wilson, *Gardeners Forum*, September 1961.

RABBIT REPELLENTS

In the June issue of the Pennsylvania Horticultural Society's newsletter, "*News*," there is a comprehensive survey of experiences in repelling rabbits. Strangely, there were no reports on the success or lack of success with the commercial repellents. However, a number of remedies were supplied by the members.

Dried blood, a fertilizer, spread around plant material proved very effective. Black pepper or moth balls sprinkled around choice plants seemed to work. Partially buried coke bottles give off a sound that is supposed to disturb rabbits. Black plastic mulch spread over the ground disturbs rabbits and helps to keep them away from the garden.

A good patch of clover may not be a repellent but it serves to attract rabbits away from other plants. In the winter time, one report indicates that prunings from apple trees spread around young trees served to feed the hungry bunnies, at least they chewed on the cuttings and not on the trees. American Horticultural Society *Gardeners Forum*, September 1961.

BOOK REVIEWS

If you need a present or an award for one of your friends who is a garden enthusiast or, in fact, for anyone who loves beauty, there are two outstanding books which you could consider as a gift.

The first is ***The Wonderful Life of Flowers*** by Paul Jaeger, published by E. P. Dutton & Company, New York. Nothing has ever been published which can compare with this particular book, in beauty as well as in content. The author is a Professor at the University of Strasbourg who has been able to get together a most interesting discussion of the forms and functions of flowers, and who has also collected a set of photographs such as do not exist anywhere else. Their reproduction is beyond praise. The artisitc taste of the many photographers who have contributed is equally remarkable. Many of the flower pictures are in full color produced by a process which brings out the full beauty of each photograph. Many of the photographs are most dramatic, whereas others are of a tender beauty and still others give a most remarkable indication of the plant as it occurs in its native habitat. One might almost say that this book presents a special danger, namely that one will become so engrossed in going through the pictures and the text, that it should only be perused during a vacation period.

The second book is ***Plant Marvels in Miniature*** by C. Postma, published by John Day Company, New York. This book is quite different, in that it is primarily a picture presentation in superb black and white photographs of a limited number of plants, showing close-ups and microscopic views of the plants considered. These are undoubtedly among the very best plant photographs, and especially microphotographs ever taken. The pictures have about the same dramatic impact as those in Jaeger's book. The book, however, does not have the scientific significance of Jaeger's book, since it does not have the really excellent text on flower biology, yet a certain amount of description is included with it, which makes it possible to appreciate each picture to a greater extent.

F.W.W.

FRIENDS OF THE GARDEN NOTES

Another new benefit to members of the Friends came along in December, in the form of a sale of surplus orchid plants from the Garden's famous collection. Mostly Cattleyas, with some Cypripediums and other varieties, several dozen of the surplus orchids were offered at a one-day sale on December 15, to Friends only on a first come first served basis to Friends only. About 100 plants were sold. While the sale was a great success many people had to be disappointed because of the limited supply. Should more plants become available a sale will be announced at a later date.

* * *

Flowering orchid plants from the Garden's famous collection will be given away as door prizes at the Friends Preview of the Orchid Show on Thursday, Feb. 1. If you hold a lucky number, you will receive free a beautiful Cattleya orchid in full bloom, *if* you are there to collect it. No deliveries are possible, winners must collect their plants at the Preview party.

* * *

A new service to Friends, and a new feature of the Friends' office at the Main Gate is the presence there of a newly-installed "Gardeners' Swap Board." This simple device provides a central location through which members of the Friends may publish both their garden needs and their surpluses. If, for example, you have separated your irises and happen to be long on them at the moment, but would love to get your hands on a few more primroses, simply post a notice on the Gardeners' Swap Board at the Friends office, and see if you find someone to trade with. It would be worth your time to stop in and check the board from time to time, to see if anything you need may be offered for trade. Rules for using the Board, a privilege open only to Friends, are available at the office. It's easy and it's fun—and perhaps profitable to you.

EDUCATIONAL PROGRAMS 1962
MISSOURI BOTANICAL (SHAW'S) GARDEN

Activities for Adults and Children

Saturday Nature Programs for Children

Free—No advance registration required. Every Saturday morning, 10:00 to 11:30 A. M., Museum Building. Enter at Cleveland Avenue Gate.

Nature study programs are provided every Saturday morning for children ages 7 to 16 in the Garden and Greenhouses. The children are given instruction in the world of plants and their association with man, animals, birds and insects. They are encouraged to make collections. They plant seed, bulbs and make cuttings of plants and work in their outdoor flower and vegetable garden plots. These programs offer action, recreation and the fun of taking home their collections, decorations, seedlings, cuttings, bulbs and the produce from the garden plots. Programs for holiday seasons are related to the plant lore associated with them.

Specific programs for each month are listed in the Bulletin.

For further information call TOwnsend 5-0440.

Pitzman Summer Nature Study Courses

A Free Summer Nature Program made possible by a grant from the Pitzman Foundation is offered for children ages 7 to 16. Children have a fundamental curiosity about everything going on around them and these summer courses of two sessions, given by the Garden, encourage this interest in living things and answer many questions that arise from a closer contact with nature.

Registration for the first session will be June 18th and for the second session July 23rd. Further information about the courses and registration will be available at the Main Gate after May 1st, telephone TOwnsend 5-0440.

Pitzman nature boy awaits an unwary "dragon" or "damsel" fly to add to his collection.

PHOTO BY ARTHUR FILLMORE

LECTURES

On the first Monday of each month, from October through June (with the exception of January) a free lecture is given at 8:00 P. M., Museum Bldg. of the Garden. The speakers are usually members of the Garden staff telling about some interesting phase of research work at the Garden or on field trips. Most of these talks are illustrated with colored slides. Subjects and speakers are announced in the Garden BULLETIN and the newspapers.

GUIDED TOURS

Organized groups and classes can obtain trained guides for visits to the Garden by telephoning TOwnsend 5-0440 at least ten days before their visit. Adults in tours, other than teachers with their classes, are expected to pay the usual admission charge to the Climatron but there is no charge for children or teachers with class groups.

SELF GUIDING TOURS

Climatron.—An instructive pamphlet is available at the Climatron.

Tree Trail.—An illustrated guide sheet is available free at the Main Gate Office.

Nature Trail. — This interesting marked trail begins near the Climatron and leads into the wild parts of the Garden.

Children collecting butterflies and other insects for identification and study.

PHOTO BY ARTHUR FILLMORE

Courses for Adults in Home Gardening and Botany

The Garden is offering a series of courses in Gardening and Botany. The courses will be open to all interested persons. The fees charged for the adult courses include all materials. Most classes and practice sessions will be held in the classroom and greenhouses of the Garden's Experimental Greenhouses which can be reached by entering the Cleveland and Tower Grove Avenue gate.

Registration for all courses must be made in advance as the number of persons who can be accepted for a given course is limited. Should interest warrant, second sessions will be considered. Should less than fifteen persons register for any course, it may be dropped, in which case the fees will be refunded.

All courses will be taught by Garden Staff members and by selected specialists. Fees based on the amount of time and materials supplied by the Garden.

Home Gardening

101 Home Garden Preview, *Basic course*

For the home owner, a non-technical basic course including facts and procedures for planning, planting, pruning, fertilizing, watering and general maintenance of home grounds.

8 Sessions—Fee $10.00 Tuesdays, Jan. 9 to Feb. 27 8:00 to 9:30 P. M.
Experimental Greenhouse

104 How to Propagate from Seed

Fundamental facts and procedures for producing annuals, biennials and some perennials from seed for use in your garden. The Garden supplies seed, germinating media and soil for four metal flats of seedlings which you may take home. Persons wishing to supply their own seed must bring it to the first session.

5 Sessions—Fee $12.00 Tuesdays, Mar. 13 and 20
Experimental Greenhouse Apr. 3, 10 and 17 1:00 to 2:30 P. M.
Thursdays, Mar. 15 and 22
Apr. 5, 12 and 19 8:00 to 9:30 P. M.

105 How to Propagate from Cuttings

Fundamental facts and procedures of producing trees, shrubs and perennials from cuttings (asexual reproduction). The Garden will supply one plastic covered metal propagating flat, media and plant materials for 40 to 50 kinds of plants.

5 Sessions—Fee $12.00 Tuesdays, Oct. 16 to Nov. 13
Experimental Greenhouse 8:00 to 9:30 P. M.
Thursdays, Oct. 18 to Nov. 15
1:00 to 2:30 P. M.

107 BULBS, INDOOR–OUTDOOR

Instruction on bulb forcing and outdoor bulb culture will be given. The Garden will supply each student with 24 top quality bulbs in 7 inch clay pans which may be taken home. The Garden will also provide space for cool treatment which the forced bulbs require.

2 Sessions—Fee $8.00 Tuesdays, Oct. 2 and 9 8:00 to 9:30 P. M.
Experimental Greenhouse Thursdays, Oct. 4 and 11 1:00 to 2:30 P. M.

109 PREPARATION AND CARE OF LAWNS

General instruction concerning the preparation, care and maintenance of lawns. Special attention will be given to individual problems.

3 Sessions—Fee $6.00 Tuesdays, Aug. 14, 21 and 28
Museum Building 7:00 to 9:00 P. M.

110 HOME ORCHID CULTURE

Orchids suitable for home culture and best ways of growing them. Potting demonstration and practice. Students may take the plant they pot home.

1 Session—Fee $10.00 Saturday, April 7 10:00 A. M. to 3:00 P. M.
Orchid Greenhouse

111 PLANTS UNDER ARTIFICIAL LIGHT

Latest up to date thoughts and practices on use of artificial light for plant propagation and culture. Observations of Garden's application to High School Class Room Chambers.

1 Session—Fee $4.00 Thursday, March 8 7:30 to 10:00 P. M.
Lower Greenhouses

BOTANY

201 BOTANY FOR BEGINNERS. *Basic course*

General instruction in botany. A semi-technical course to give the amateur an understanding of the plant world.

8 Sessions—Fee $10.00 Tuesdays, Jan. 9 to Feb. 27
Museum Building 8:00 to 9:30 P. M.

* * *

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 10:00 P. M. Tower Grove House is open daily from 9:00 A.M. to 5:00 P.M. (April through November); 10:00 A.M. to 4:00 P.M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

February 1962
Volume L
Number 2

COVER: Dr. Went and the Climatron Aquatunnel. The lily pads seen from below appear to be surrounded with a "halo" of light from the sun. Photo: *St. Louis Post-Dispatch.*

Enclosed with this issue of the BULLETIN is a reprint of a feature story on the Climatron pool and Aquatunnel which appeared recently in the *Post-Dispatch.* It describes some of the problems which have been overcome in achieving the remarkable effects of this unique attraction.

CONTENTS

Old Favorites and New Introductions for the Home and Greenhouse

Observations of Libraries

Tropical Orchids Near the Texas Border

Friends of the Garden Notes

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Guest Editor for this issue: RANLET LINCOLN.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Vol. L No. 2 FEBRUARY, 1962

OLD FAVORITES AND NEW INTRODUCTIONS FOR THE HOME AND GREENHOUSE

LADISLAUS CUTAK

The winter season gives all of us gardeners an opportunity to catch up on garden reading, perusing through catalogs, planning for next spring's planting, learning more about current horticultural practices, and evaluating our house plants as well as those that grow in our greenhouses.

Harking back to the good old days, as the old-timers proudly muse, back in the era of the long-reigning Queen Victoria, there was great interest created in plants from tropic regions. It was the era of horticultural endeavor. Nurserymen sent out explorers to various parts of the world to collect spectacular foliage plants which in turn were to grace the conservatories and homes of horticultural patrons. Anyone who could afford a little greenhouse fell into the trend. However, since the average home was so stuffy and not too well lighted, only the very tough plants could be grown under such conditions. These plants, even today, are still popular and apparently always will be. Numbered among the old favorites are Boston Ferns, Aspidistras, Sansevierias, Anthericums, and a host of others. I doubt if these subjects will ever go out of style.

After the Victorian era interest in plants sagged and was really not revived until modern architects began to incorporate large glass windows and walls in modern buildings. The result was that an abundance of light was brought indoors which made it possible to grow plants that at the same time harmonized with the surroundings. Almost any new home being built today has a picture window which makes it possible to grow many more plants than in the old fashioned parlors of yesterday. Thus, interest in plants has risen phenomenally. Today, there is a wide selection of foliage plants to fill every need.

There are hundreds of old favorites and new introductions. They belong to diverse plant groups and have their particular merit. I feel that all of them can be placed in either of three categories: shade plants, diffused light plants, and sun lovers. The shade-loving plants are adapted to quite shady situations but this doesn't mean that they must be grown in darkened nooks all year round. They will enjoy some light regularly in order to present a healthy and vigorous appearance. The semi-shade plants revel in diffused sunlight while the sun-loving plants necessarily require full sun but can also be grown in well lighted situations. Choose wisely such plants that are adapted to the amount of sun or shade, and learn the water requirements of each plant. Some pots may dry out faster than others due to temperature variations. Above all, don't overwater as waterlogged soil makes plants sick and encourages rot. Feed the plants judiciously when actively growing, and for best results, when using manufactured products, follow the manufacturer's directions to the letter.

SHADE PLANTS

A few plants, like the Cast Iron Plant *(Aspidistra lurida)*, would not mind if forgotten and given no water for two or three weeks at a time, though it would like its leaves washed off once in a while. That gives a slight hint as to the ease with which this plant can be grown. Once established in a container very little care need be lavished upon it. No other house plant, with the possible exception of the Sansevieria, receives so much abuse yet gives so much in return. It is a plant well suited for game rooms in basements that are semi-dark. This old house plant is one which seldom fails: whether kept hot or cold, in east, west, south or north window. Kitchen gas does it no harm and smoky atmosphere seems not to bother it in the least. For a smoke-filled tavern, hotel lobby, hall room, basement or any other poorly lighted place, the Aspidistra is *the plant*. The Aspidistra is characterized by very tough green leathery leaves on tough erect petioles and there is also a striped green and white variety. Although the plant adapts itself to all adverse conditions it is advisable to keep it moist but not too wet and sponge the leaves occasionally to keep off the dust.

Ferns are good subjects for well shaded nooks as also are the Selaginellas, popularly known as Club Mosses. Ferns are found in shaded places in moist forests, beside waterfalls, and in humus-filled pockets on rocky ledges. Ordinarily, they do not like the dry air of our living rooms but a few make ideal house plants. The old standby is the Boston Fern, *Nephrolepis exaltata* var. *bostoniensis*, which is often found in barber-shop windows and beauty parlors. It and its various varieties are strong growers with long fronds which sometimes are wavy, ruffled and plumy. A fern which is more tolerant of house conditions than any other member is the House Holly Fern, *Cyrtomium falcatum* and *C. rochfordianum*. Both are strong plants with stiff fronds possessing dark green leatherlike leaflets which are studded with spore cushions on the underside. Some people are under the impression that the spore cases are bugs and more than once the Garden has been called about what to do with the "bugs." Species of Pteris, commonly known as Table or Brake Ferns, do well in pots on a table if the soil is not allowed to dry out. The colorful ones are *Pteris cretica* var. *albo-lineata*, which produces leathery leaflets with a broad cream center stripe, and *P. ensiformis* var. *victoriae*, a dwarf fern whose leaflets are prettily variegated with silver-white. *P. rivertoniana* is a graceful serrated lacy-foliaged fern used a great deal in dish gardens and terrariums. The large Mexican Tree Fern, *Cibotium schiedei*, with gracefully curving lacy fronds of the brightest green, is frequently used for stage decorations while another dwarf tree fern, *Alsophila cooperi,* can also be grown in homes. For some time there has been a great interest in the Hawaiian Tree Fern, *Cibotium chamissoi,* which is being imported to the mainland on a large scale. Department stores frequently decorate their windows and display counters with this plant. Usually, only the growing tops are sold which, after a while, start producing the beautiful lacy fronds. An important thing to remember is to keep the shaggy trunk moist all the time. Probably the most striking and unique fern is *Asplenium nidus-avis,* called "Bird's-nest." It sends up broad bright green leaves in birdnest fashion from a central core of stem. Staghorn Ferns should be grown on wooden blocks and hung in patios or porches where they will do surprisingly well. Dip these ferns in water frequently to keep them from drying out. The best known stag fern is *Platycerium alcicorne,* which is a very good keeper. The most outstanding and celebrated staghorn in the Climatron is *P. grande* which hangs from the portico. No other plant evokes as much comment as it. The dainty Adiantums or Maidenhair Ferns require much humidity, therefore should be grown in terrariums for best results. They produce slender wiry stems and delicate fan-like fronds of bright green leaflets.

Selaginellas are best grown in terrariums where constant humidity prevails. There are several good species available including the graceful spreading and creeping forms like the irridescent S. *uncinata* and the bright green S. *kraussiana,* but some are coarse and stiff upright growing types which resemble ferns very much. If grown in pots immerse the containers in water once or twice a week as soil must be kept moist for best results. A mild plant food or liquid manure can be applied to ferns and club mosses about twice or three times a year. A plant that looks very much like moss is the dainty Baby's Tears, known botanically as *Helxine soleirolei.* This Corsican ground cover will fill a pan or bowl in no time and spill over the pot gracefully. It needs shade and plenty of water as well as warmth. It can be worked onto a sphagnum-covered cross which it will cover readily and in this

"Aluminum Plant"—*Pilea cadierei,* southeast Asia.

ornamental effect is often sold during the Lenten season.

Don't overlook the Bertolonias, which are small tropical plants, suitable for terrariums or any other kind of glass gardens. They require a moist atmosphere, shade and lots of drainage. The fuzzy leaves are beautifully streaked with silver green or brown and truly are outstanding foliage plants. They are a little more difficult to grow in the house but when culture is mastered the grower's pride reaches a high level. The best varieties are *B. maculata*, *B. marmorata*, and *B. pubescens*, all native to the humid forests of Brazil. Equally attractive foliage belongs to the Episceas which require high humidity and dampness. These plants, which are related to the African Violets, do not want to be chilled at any time. They produce small runners with new plants forming at the ends and therefore are suitable as basket plants or subjects for pedestals. There are numerous varieties, all of them presenting spectacular foliage.

Other shade-loving plants worthy of trial are the Calatheas and Marantas. Sometimes they are known as Prayer Plants for the way they fold their leaves upward at night. Most of them prefer shade, warmth, moist loose soil and humid air. Many varieties, all with colorful foliage, can be obtained from the better known florist shops. One of the old favorites is *Maranta leuconeura* var. *kerchoveana*, a low plant with showy chocolate blotched green leaves. The most magnificent of all Calatheas is *C. zebrina*, but to be happy it must have warm humid atmosphere. It is a sturdy plant with large emerald green velvet leaves striped with lighter and darker hues along the veins.

Plants Requiring Diffused Light

Under this heading are included plants best suited for our homes. They require plenty of light but it must be filtered rather than direct. There is a great variety of plants to choose from but probably none are as ornamental and as easily grown as the Figs. They are the most durable subjects for patios, stores, factories, or homes wherever bold effect is needed. The commonest and most indestructible are *Ficus elastica* with its varieties and *F. pandurata*, also known as *F. lyrata*. The first is known as the India Rubber Tree and has probably been grown by every house plant devotee. A variegated form with cream, white and green foliage is more desirable than the plain glossy green plant. A more robust form is variety *decora*, which is now more commonly cultivated. The other is the Fiddle Leaf Fig with very large leaves shaped like the back of a fiddle. The leatherlike dark green leaves are frequently used in arrangement pieces. The plant grows large and is suitable for pot or tub culture. In order to keep the leaves all the way down the stem it is necessary to supply plenty of moisture to the roots. The Zulu Fig, *F. utilis*, is another large-leaved specimen for places that demand rugged individuality. The true fig which produces the edible fruit, *F. carica*, is not to be overlooked because its foliage is deeply lobed and highly ornamental. There are a number of small-leaved Figs which remind us of

Citrus or Laurel trees. The most graceful of them is *Ficus benjamina* with long drooping branches that are covered with small dark green leaves. *F. nitida* is an upright grower producing a compact head of foliage quite similar to the preceding. A creeper with the tiniest leaves is *F. pumila*, native to the Orient. It loves best to cling closely to walls and makes a beautiful tracery with its small rounded green leaves. One private indoor swimming pool in St. Louis uses this fine creeper to cover a background wall. A good example of this type of wall covering can also be seen in the Linnean House at the Garden.

Although a good many of the Ivies can withstand lots of bright sunshine there are a few which prefer filtered light for best development. The Canarian Ivy which bears yellow speckled or variegated foliage is one of these. There are also improved strains of the old English Ivy that require semi-shade such as "Merion Beauty," "Silver King," "Glacier" and several others. The variegated Ivies, of course, are very popular as pot plants. Ivies, as a rule, prefer cooler situations than most other house plants and they also like to be kept somewhat drier. A number of Cissus are excellent trailing plants for boxes and hanging baskets. One of the most dependable and easy of culture is *Cissus rhombifolia* or Grape-Ivy. It can withstand dry air. Another grape relative is the Kangaroo-vine *(Cissus antarctica)* which has notched or toothed thick glossy leaves. The most beautiful is the tropical *C. discolor* but it needs greenhouse conditions to bring out the luxuriant foliage. A robust grower coming into great favor is *Tetrastigma (Cissus) voineriana* from Puerto Rico.

Palms and cycads lend character and distinction to the tropical scene and should be employed in patios, lighted lobbies or spacious entrance-ways. Many of them have no desire for strong light and therefore are suited to life in our living rooms. In general, palms require a fairly heavy rich soil and plenty of water. The most decorative and durable is *Howea (Kentia) forsteriana*, known as Paradise Palm. Many of the palms do not acquire the graceful character until the adult stage, so for this reason they are not grown or used as much in the average home but there is a group of dwarf types, known as Chamaedoreas, which should be tried. The Chamaedoreas reach full development in 6–8 inch pots. Two of the nicest diminutive table palms are *Chamaedorea elegans* and *C. erumpens*. The latter hails from Honduras and suckers rather freely.

Sanchezia nobilis, Ecuador.

Cycads are often referred to as palms, but really are the most primitive of the living gymnosperms. They grow slowly and as small potted plants are excellent for the home. The best known is *Cycas revoluta,* which possesses stiff fern-like leaves in a crown at the top of the trunk. Another species, *C. circinalis,* with shiny dark green leaves, is available in the trade but it is not as stiff as the preceding. Encephalartos is a South African genus with prickly stiff leaves and highly decorative appearance. The Mexican Dioons are also very attractive even in the juvenile stage.

Pellionias are tropical creepers which put one in mind of the Wandering-Jew or Tradescantia but their leaves are considerably thicker and more leathery with interesting marbled markings. They love to be kept moist and warm. Two species are in the trade, *P. daveauana* and *P. pulchra,* the first with bronzy leaves with light green centers and the second with a blackish network of veins on a dark green background. A similar trailing plant is *Hemigraphis colorata* from Java which has been advertised by some unscrupulous nurserymen as a "red leaved ivy." It produces dark metallic purple leaves and is heavier textured than the Pellionias. Still another low creeper is Fittonia which has larger leaves than any of the preceding plants. Although attractive in its own pot this excellent creeper is generally used to cover the tops of planter boxes, tubs or larger containers in which taller plants are grown. Fittonias also look attractive in terrariums. The foliage presents a network of either white or red veins on a dark green background, and because of the intricate design the well known species are dubbed "Mosaic Plants."

Within the last decade a number of new introductions came on the market, one of the most attractive being the Aluminum Plant, *Pilea cadierei.* The leaves are quite fleshy and of a vivid green color overlaid with shining silver blister-like blotches. The plant propagates and grows very easily but needs a warm humid atmosphere. It will branch and get about a foot high but looks very attractive even in small containers. Another interesting Pilea is *P. involucrata,* which when first introduced was advertised as the "Panamigo Plant." It has a corrugated shiny dark green leaf tinted purple on the underside. The Artillery Plant, *P. microphylla,* is a near relative that likes to grow underneath benches in a greenhouse in moist cinders or gravel. The fleshy stems and branches are covered with masses of tiny bright green leaves. Young plants are desirable for dish gardens.

Peperomias are very attractive fleshy herbs which prefer filtered light as they often are found in tropic forests, sometimes growing on fallen tree trunks. They like to be kept somewhat on the drier side especially those with leatherlike foliage. The most popular is *P. obtusifolia* with rich obovate glossy green leaves. There is also a variegated form that is highly desirable. About 25 species are available in the trade, the most colorful being *P. sandersii* which has watermelon designs of silver on dark green background. *P. hederifolia* is one of the most outstanding bushy species with rounded leaves of metallic-gray to olive in color and deeply crinkled.

Dracaenas and Cordylines are fascinating foliage plants once again coming into prominence. They are mostly natives of tropical Africa and require no special treatment. They can be kept on the drier side. Too much water turns the leaves yellow and causes them to drop. They are about the hardiest of house plants. The commonest is *D. fragrans* which enjoyed popularity in the Victorian era and still remains a great favorite. Sometimes it is jokingly referred to as "Corn Plant." There are striped varieties of it. Another great favorite is *D. deremensis* which has narrower dark green leaves from which two or three colorful sports evolved; one with a wide cream midstripe is known as *D. bausei* and the other with pin-striped foliage is known as *D. warneckei.* Sometimes all three variations appear on the same plant which has a tendency to cluster or branch. Most of the Dracaenas produce leaves in rosette fashion at the ends of the stems but *D. godseffiana* has its leaves carried on thin wiry stems. The small deep green leaves are irregularly spotted with cream or yellow and sometimes the name "Gold Dust Dracaena" is applied to it. A mutation with much heavier spotting in the leaves, known as "Florida Beauty," is superior to the type. One of the most spectacular is the slow-growing dwarf, *D. goldieana,* with silver-green crossband designs but it is more of an oddity than anything else. Dracaenas are often confused with Cordylines but the two groups are very close horticulturally, differing technically in size and character of flower and fruit. Cordylines are native to Australia, the South Seas Islands and East Indies and one species is the famous Ti-Plant which the Hawaiian girls employ in making hula skirts. *Cordyline terminalis* and a number of mutants derived from it produce bayonet-shaped leaves which are highly colorful in various shades of red. Although Dracaenas and Cordylines present no cultural problems, mealybugs love to congregate in the crowns and may cause stunted growth, but a careful check will prevent an infestation.

The Screw Pines are old favorites serving various decorative purposes in and around the house. In summer they can be placed outdoors in window boxes or vases using them as center pieces and planting other colorful material around them. During winter months potted Pandanus can be placed in jardinieres, or on mantels and tables to add a touch of green. Pandanus plants bear narrow strap-shaped leaves with or without fine marginal spines. The leaves grow in compact spreading tufts and young plants are frequently attached all along the stem, which can be easily detached and rooted to start new propagations. The best known is *P. veitchii,* its dark green leaves margined with broad bands of white, but more spectacular is *P. sanderi* which is more pronouncedly striped with golden bands. *P. pacificus* is a glossy green-leaved species as is *P. utilis,* but the latter is characterized by red marginal spines.

Earlier I spoke of the Ivies as being such wonderful decorative house plants but they are trailing and vining plants. Near relatives to them are the various Araliaceous plants which are gaining popularity day by day. Some of them have rather massive foliage but a number with smaller leaves make excellent pot plants. Such are *Aralia balfouriana, A. filicifolia, A. guilfoylei* var. *victoriae* and *A. elegantissima,* to name a few. In the trade these are generally sold under Aralia but the first three are now included under Polyscias and the last as Dizygotheca in botanical literature. Balfour's Aralia makes an excellent pot plant. Its leaves are small and somewhat resemble those of a *Pelargonium zonale* which are edged with white. The second species is an all bright green type with leaves finely cut like those of a fern, the third is another graceful lacy-foliaged plant characterized by white variegation, and the last is the daintiest of all with the most delightful dark red brown foliage. The leaves are usually divided into five very narrow long segments and the segments are all jagged toothed.

Some of the tropical foliage plants are a little touchy when night temperatures go down considerably but the Aralias do not mind this so much. They withstand temperatures of 50 degrees F. very nicely and some will even tolerate much lower temperatures. In this respect *Aralia sieboldii* is one of the best, as are also *Fatsia japonica* and *Fatshedera lizei*, both with bold leathery foliage which is palmately cut. The latter is an interesting bi-generic cross implying the best qualities of a Fatsia and Ivy. It is said to withstand outdoor temperatures in New York if set out in well protected places. Schefflera is another relative with almost indestructible qualities. It will attain tree size if allowed to grow freely but will remain small for years if confined in small pots. It bears large digitate glossy leaves and is a good subject for entrance-ways as it can tolerate much shade. It now frequently decorates store windows, hotel lobbies and other situations where more tender plants would succumb to neglect.

The Maricas or Tropical Iris are wonderful house plants because they are so easy to grow and have a pleasing green appearance all year round. The leaves are flat like an Iris and appear in fan shape. They also present a graceful effect and a whole plant can easily be used in floral arrangement. They do produce Iris-like flowers but last only a few hours, so are not grown for the blossoms but rather for the beautiful symmetrical foliage. *Marica gracilis* and *M. northiana* are the two common forms found in homes, the first more slender and graceful, the latter larger and bolder in all its parts. A rarer flimsier yellow green relative is *Trimezia martinicensis* and not to be overlooked are the African Moraeas with more blue-green foliage.

Jacobinia is both a flowering and foliage plant worthy to be included in any home collection. The leaves are large dark green and somewhat crinkled and form a compact bushy head. Give it plenty of water and semi-shade. The leaves will droop and wilt easily if allowed to dry out but will perk up nicely with a good drink of water. The best species is *Jacobinia carnea,* both for its dense terminal spike of pink flowers and crinkled foliage. Other excellent member is the newer

J. suberecta from Uruguay which is more or less a prostrate type and excellent for hanging baskets. It is used as an edging or border plant in the Climatron, its greyish-green leaves and burnt orange flowers making a good appearance. Aphelandras deserve a trial also. Some have very beautiful leaves particularly those with velvety texture, often marked with silver along the midrib and main veins.

There are many more interesting plants for the home. Why not visit the local nurseryman and see what he has to offer and if he doesn't have as great a selection as expected send for catalogs of out of town growers. Peruse the ads in garden and horticulture magazines for these firms. While on the subject of catalogs, do not overlook the book called ***Exotica*** put out by the Julius Roehrs Company in Rutherford, New Jersey. It is the most fascinating and informative volume put out today—a sort of pictorial encyclopedia with thousands of tropic plants illustrated. The cost, about $30.00 for the newest edition, may seem prohibitive to the average gardener but it is the most comprehensive book of its type on the market and well worth every cent. If you were to buy 5 to 10 current horticultural books at present prices they would still be much higher in cost and not near as well illustrated (pictures help both the amateur and advanced student immensely!) and comprehensive in scope as ***Exotica.***

SUN-LOVING PLANTS

A great number of plants that are used for bedding purposes outdoors during the summer also can be useful house plants in sunny windows. Among these the Coleus are preeminent. They are all small herbs and shrubs with colorful foliage. All root readily from short cuttings and can be sheared and pinched to keep them dwarf and bushy. For best results, however, new plants should be started yearly. The old "Golden Bedder" is still one of the leading varieties for carpet bedding and window gardening. It has golden yellow foliage. Another old timer is "Verschaffeltii" which offers brilliantly colored crispy foliage, but there are quite a number of newer mutants which are far superior to the old favorites. They can be seen in the Climatron and the most desirable are "Paisley Shawl," "Beckwith's Gem," "Tapestry" and "Russet." Coleus are subject to mealybugs, therefore careful watch must be maintained in order to prevent infestation.

Acalyphas are also nice window plants, resembling Coleus superficially, but the plants are more robust and stiffer in appearance. The best known variety is *Acalypha wilkesiana* var. *macafeana*, a highly colorful foliage plant with leaves of red marked with crimson and bronze. If grown in shade the leaves will revert to green and white and are then not nearly as pretty as the coppery ones. *A. wilkesiana* var. *obovata* from Polynesia is also spectacular, its leaves being green edged cream-white, later changing to copper with rose margins.

Abutilons are still other attractive window plants and some species are also used for bedding. A striking handsome species is *A. megapotamicum* var. *variegatum.* It comes from Brazil. A maple-leaved form with variegated yellow and green foliage is *A. striatum* var. *thompsonii.* All the variegated forms are grown for foliage and frequently used for bedding purposes. They will grow bushy and tall but can always be pinched back to keep them ideal for pot culture. Give them plenty of light and water.

Aucubas are handsome small shrubby plants with large lustrous often variegated leaves. There are several horticultural forms with various degrees of variegation, the commonest being *A. japonica* var. *variegata* with yellow and green foliage. Aucubas prefer a cool location and can stand low temperatures.

Of all the decorative plants the Crotons are the most colorful, possessing the brightest hues imaginable. They definitely need the full sun to bring out the brilliant colors, so grow them in the sunniest positions in a window or greenhouse. If at all possible place the pots outdoors during the summer so that the fullest colors are attained and maintained throughout the winter when light is not always sufficient in the average home. Give the Crotons plenty of moisture also. The foliage is diverse and can be narrow or broad, short or long, lobed or entire, interrupted or whole, and straight or curling in corkscrew fashion. Botanically, Crotons are Codiaeums and come from Polynesia, Java, India and Malaysia. Many horticultural forms are offered in the trade and "Mona Lisa" is a very likeable one with broad areas of yellow on a background of dark green. There are a number of them displayed in the Climatron beds, especially in the Hawaiian area.

While on the subject of colorful foliage, do not overlook *Graptophyllum pictum* and *Pseuderanthemum atropurpureum* var. *tricolor.* The former is an upright bush with beautiful oval purplish brown leaves with pinkish veins and stem while the latter has shiny metallic red and pink leaves. Both can be topped to produce a bushier effect. *Pseuderanthemum alatum* is another worthwhile subject, known as the "Chocolate Plant" from the coppery-brown papery leaves. The most outstanding colorful leaves, however, belong to *Hibiscus cooperi.* Hibiscus are usually grown for their profusion of large flowers but this one is definitely an exotic foliage plant, its leaves mottled with green, white, cream and pink.

A highly ornamental and curious plant is *Acanthus montanus* from tropical Africa. It has a stiff olive-green broad leaf divided into spine tipped lobes. The leaves are very decorative and are said to have suggested the foliage designs at the top of Corinthian columns. The plants require a rich, light, well-drained soil and lots of sunshine.

Ruscus aculeatus is a botanical oddity and at the same time a useful house plant. It is called "Butcher's Broom." The true leaves are bract-like structures usually unnoticed by the non-botanical person. What one would call leaves are really *cladodes* or modified stems which are laminated and have the appearance of leaves. Inconspicuous greenish yellow flowers are borne on the midribs of the cladodes which later turn into bright red berries. Ruscus is a striking and accommodating plant, tolerant of all kinds of soils, and will grow well in full sun or in dense shade.

Buxus are evergreen shrubs of rather slow growth with shining, small foliage. They need well drained soil. In greenhouses the dwarf forms are sometimes used in borders but likewise make excellent pot plants. *Myrsine africana* is another small shrub with small coriaceous leaves resembling Boxwood but is not as hardy as the latter. Still another nice evergreen is *Podocarpus macrophylla* which is densely bushy with long narrow dark green leaves. The branches are superb keepers and are frequently used for decorative purposes. *Murraya exotica* is another excellent shrub with glossy green foliage and *Pittosporum tobira* should not be overlooked either. The latter has obovate leathery leaves and makes an excellent potted specimen. The Silk Oak, *Grevillea robusta*, with lacy fern-like foliage, is a medium-sized tree but will remain small in a pot. It wants a good rich garden soil with rotted manure but can be kept on the dry side without harmful effects. It is best to soak the pot thoroughly and not water again until the soil dries out. Araucarias are very decorative pot plants grown in windows or as table subjects. They prefer lots of light and should be kept cool at night. Give them room to develop and plenty of light, otherwise they become ragged and straggling specimens. The Norfolk Island Pine, *Araucaria excelsa*, is the common form sold by florist shops. It produces soft non-spiny foliage of a lovely shade of green and the branches are widely spaced. *A. biduillii* is a dark green compact tree with dense branch growth and closely set spine tipped foliage. Makes a good rugged pot plant.

The pomegranate, *Punica granatum*, is worth growing for its decorative value. There is a dwarf form known as *nana* which looks attractive in a 4-inch flower pot. The small myrtle-like shiny leaves and scarlet flowers make it a desirable plant to be used in borders and it also can be clipped into a hedge.

The cultivated Banana has a very respectable antiquity. It was known in prehistoric times and, in fact, is linked traditionally with the Garden of Eden as the tree of knowledge of good and evil. Although the common Banana is a robust grower there are a few table varieties that can be grown in homes where larger plants are welcome. Bananas love lots of sun and moisture. The Chinese Dwarf Banana, *Musa cavendishii*, can be easily grown in a tub in a sunroom. A very slender narrow-leaved Banana is *M. zebrina*, its green leaves marked by irregular blood red blotches. In the trade it appears under the name of *M. sumatrana* but this one is still another species very rarely seen outside of its Javanese habitat.

I could go rambling on with additional species of wonderful house plants but feel enough have been mentioned from which one can choose a few favorites. There is no more fascinating hobby than growing plants in the home or greenhouse. If you have never grown plants in your home, please give them a trial and you will shortly realize the enjoyment you've missed. Good luck in your enterprise!

OBSERVATIONS OF LIBRARIES

GEORGE B. VAN SCHAACK

The librarian recently returned from a busman's holiday visiting a number of libraries on the east coast. Three of these, the Gray Herbarium–Arnold Arboretum Library at Harvard University and those at the New York Botanical Garden and the Academy of Natural Sciences of Philadelphia, contain major collections of botanical books, probably the most important in that part of the country, apart from the gigantic but much dispersed one which the federal government has accumulated in and around Washington. In large part similar to our own library these institutions have many similar problems. A fourth library, that of the American Museum of Natural History in New York, though more restricted in its botanical material, is also a natural history library serving the scientific staff of an institution not part of an academic system, and accordingly also with problems like our own.

The librarian found that all four of these libraries face the difficulties presented by lack of space, by lack of sufficient staff and by lack of funds for purchase, for binding and for repair. While each institution has made some progress against one or more of these, in general all of them are still merely "hopeful" about dealing with the rest. The Gray Herbarium–Arnold Arboretum Library moved into entirely new and adequate quarters several years ago, while the New York Botanical Garden has completed plans for a new library wing of three stack floors and a floor of reading rooms and offices. The libraries of the American Museum and the Academy of Natural Sciences, devoted as they are to many subjects in addition to botany, are much larger than our own library and its two sister libraries just mentioned. Their quarters are little more than just barely adequate and at the current rate of scientific publication will not long be even that. On the score of staff, however, they show an encouraging tendency to try to provide almost enough personnel, in number at least, although to find those of desirable training and experience is often no easier than it is in other scholarly libraries today. At the Gray Herbarium, however, the library is outstandingly understaffed, being almost entirely taken care of by Mrs. Schwarten alone; while putting all of us woefully to shame with her human dynamism may she not overspend her strength!

At one institution, at least, funds for binding are desperately needed, for many thousands of its volumes of journals are still in their parts as published, loose on the shelves, open to the hazard of frequently being misplaced or damaged, if not even lost. Increased funds are perhaps less critically needed at the other institutions, but except at Harvard the older and rarer works almost cry for more adequate shelving and often for repair. Most of this type of material at the Gray Herbarium has been removed to be placed with Harvard's rare book collections. At the other institutions most of the rarer works are shelved along with less valuable and more rugged material, apparently casually, but actually because neither suitable space for housing nor personnel for segregating them have been available. With many items no less valuable or important than those to be found in several libraries mentioned below, these collections are by very force of circumstance being treated with what seems like shocking neglect. Recently visiting one of these libraries a distinguished rare book librarian was astonished if not horrified to find almost unobtainable rarities on the open shelves. In his own library these would be in an air-conditioned room, available, to be sure, to those who needed them and could appreciate them, but until then safely away from the buffeting of less careful and knowledgeable users.

The scales are tipped full to the other side in four other libraries visited. The Pierpont Morgan Library in New York, built about sixty years ago, is a small Renaissance palace, its main room, three stories high, circled by two galleries. Here are to be seen, behind metal-grilled doors, many thousands of early books from the days of Gutenberg onward. Open to the public (although the door is unlocked only after the bell is rung!) this building is a show place where there are always on view special exhibits of the library's many treasures of manuscripts, prints and binding as well as books. Naturally in such a place, nothing may be touched or consulted. But there is an adjacent structure in which these very books may be used by anyone of serious interest and purpose; no long forms need be filled out nor personal references given, but the librarian is not slow to detect the difference between mere curiosity and genuine interest. And, the door is kept locked and guarded!

Considerably less splendid but no less well done in its style and no less adequate to its purpose is the new library of the American Philosophical Society in Philadelphia. Built on the site of an early library, in Independence Square next to Independence Hall, its exterior reproduces the original colonial structure, while the interior is adapted to modern use. Among other things this library is one of America's great depositories of material relating to its national history, containing in particular much of Benjamin Franklin's library and vast quantities of letters and other manuscripts concerning our early years. Convincing on the score of curatorial seriousness are its five-story vault for manuscripts and its full-time binder and restorer. One of the latter's duties is to mount on three-dollar-a-yard *invisible* linen frail manuscripts, which, by the way, even while under repair, must be replaced in the vault each night before it is locked at five o'clock, the hour at which the burglar alarm becomes effective!

Turning again to more strictly botanical matters, the librarian visited Dumbarton Oaks in Washington in order to see the library which Mrs. Robert Woods Bliss is gathering for the study of garden design. Here is treasure upon treasure of illustrated books dealing with gardens, in particular with their history as artistic objects and with the plants which they have contained. This collection, too, goes back to the fifteenth century, but its greatest riches are perhaps in the eighteenth and nineteenth centuries, when royal gardens of Europe reached such a peak. Illustrated works of that period devoted to garden plants were usually provided with handcolored engravings, only very rarely and in strictly limited editions with original watercolors. In the Bliss collection there are several such unusual sets, among them the many-volumed work of Kerner, *Hortus Sempervirens*, containing several hundred exquisite watercolors of plants nearly in life-size. Mrs. Bliss' librarian reported that when Dr. George Taylor, Director of Kew, recently visited there and was shown this work he remarked that seeing it was alone worth his whole trip to the United States. A separate new building to house this library and provide adequate quarters for its use is currently under construction.

Similar, though still different, and for different reasons most interesting, is the Hunt Botanical Library in Pittsburgh, just last fall formally presented to Carnegie Institute of Technology. There seems little doubt that nowhere else in America can one find any such collection of works devoted to the early history of botany and of gardening, and to the development of botanical illustration, and surely none so perfectly housed for its study. However spectacular may be its treasures the library's purpose is artistically and scientifically serious in the same sense as at the Morgan Library. In addition to continuing attention to botanical illustration and garden history there will be an active program to build a collection of botanical manuscripts and letters, botanical portraits and, in general, material relating to botanical biography. As in the Morgan Library the main collection is displayed in wall cases behind metal-grilled doors, but again, to those of serious purpose and interest the doors may be unlocked. And when they are, the contents, though often quite old, even up to nearly five centuries, are ready to be consulted without danger, for this library, like that at the American Philosophical Society, has its full-time binder and restorer.

These two groups, of four libraries each, are rather sharply contrasted. Those in the first group are all institutional libraries, adjuncts in one sense or other to the overshadowing activity of natural history research. As such "service" departments they tend to find themselves in the servants' quarters with the servants' wages. Three at least of the other group of libraries have been private collections, the passion of single individuals fortunate enough to have the means to care for them as they have deserved. And the lesson is clear—in the first group the collections increase in size and importance but they have been degenerating in condition and availability; in the second group, growth is slower but proper care is making precious material more available rather than less. Society has chosen to make it difficult for most of us to build great private collections for *its* benefit; it has yet to be wholly clear on the point that accordingly it should take the responsibility for providing for the care and preservation of the great institutional collections.

TROPICAL ORCHIDS NEAR THE TEXAS BORDER

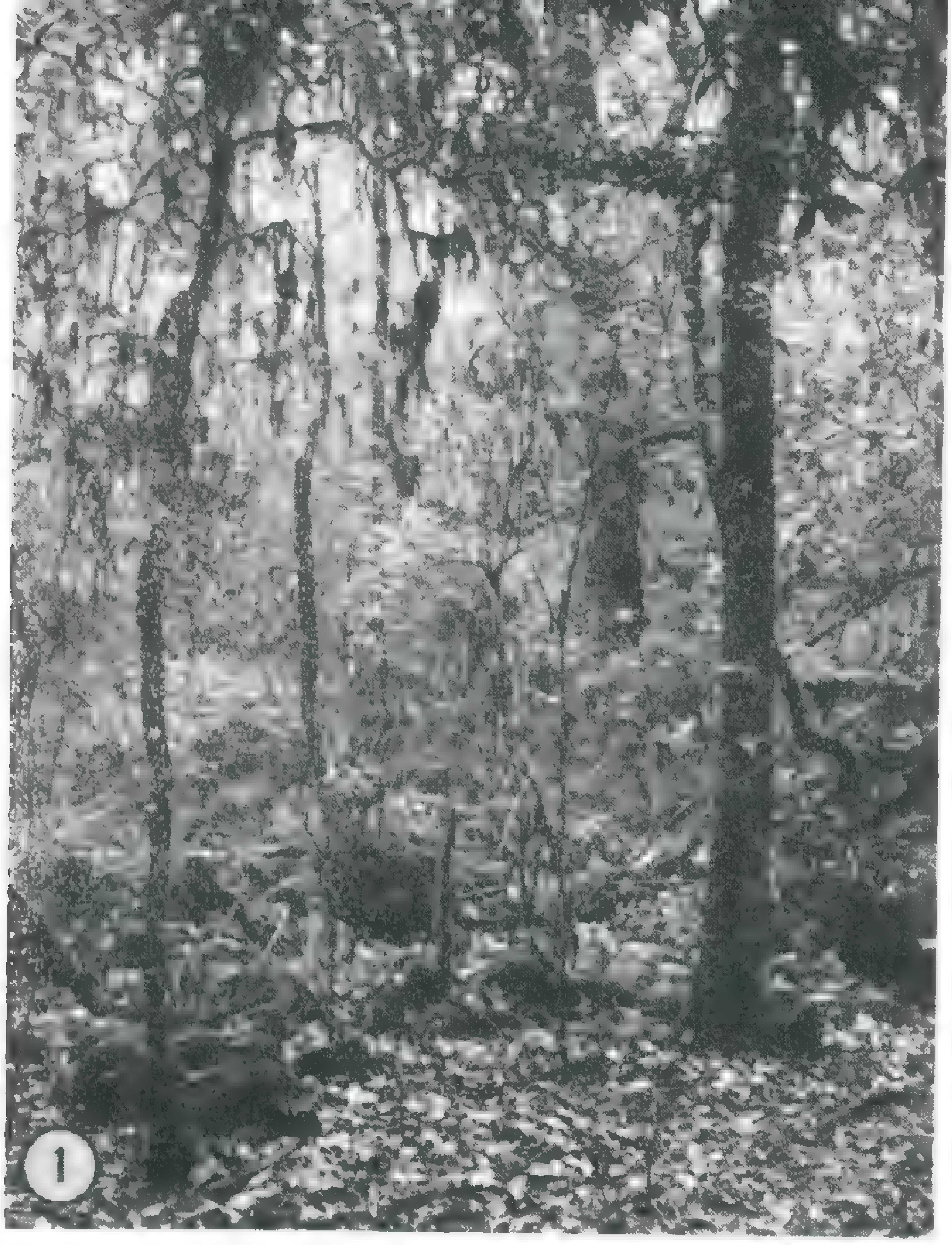
ROBERT L. DRESSLER

Many persons have collected orchids in Mexico, but there are still lots of areas in our neighbor republic where the orchids are poorly known, or have not been collected at all. Among the poorly known areas are the northern outposts of the tropical epiphytes. Most tropical species reach their northern limits in the mountains, and it is quite understandable that both botanists and amateurs have usually gone farther south, to places that are more tropical and more accessible. In late March and early April of 1960, a group of staff members and students from St. Louis spent a week in one of the most interesting localities of northern Mexico. While the main purpose of the trip was to acquaint the students with tropical biology in the most effective way, each of us found time to collect and study his own pet interest—in my case, the orchids.

"Rancho del Cielo" is the name which Mr. W. Francis Harrison (originally from Canada) has given his ranch in the Sierra Madre Oriental in the state of Tamaulipas. The name is most appropriate, as "*cielo*" has the double meaning of sky and heaven, and both seem quite applicable to Frank's ranch, which is about 45 or 50 miles south of Cuidad Victoria, or about 260 miles from Brownsville, Texas, by road. The unusual climatic features of the region and Frank's great hospitality have combined to make Rancho del Cielo a locality well known to biologists. The mountains are quite steep at this latitude, and the moisture-bearing clouds have full effect when they strike the mountains. Here, as in the adjacent lowlands, rainfall is seasonal and largely restricted to the summer and autumn months, but the moisture from heavy cloud cover is sufficient to maintain a constantly moist vegetation in many places. At elevation of 3,000 to 4,500 feet the climate is cool but nearly frost-free.

Rancho del Cielo cannot be recommended as an easy place to collect orchids. Lumber roads have been built into the area only within the last ten years. One may enter either from Encino, Tamaulipas, or farther south, from San Gerardo, through Gómez Farías. People who regularly use either of these two roads generally recommend the other one, but they are equally bad. They are so steep and rocky that they are passable only for jeeps and lumber trucks, and these vehicles have a very short life span on such roads. The surest way to reach the mountains is to catch a ride on an empty lumber truck going to one of the several lumber camps.

The vegetation along the Brownsville–Mexico City highway in southern Tamaulipas is mostly tropical but dry. At the latitude of Rancho del Cielo it is more humid than elsewhere, but the land near the highway is largely cultivated and there is little natural vegetation left. On the lower slopes of the mountains one finds "tropical deciduous forest," a relatively low tropical forest which is very dry during the



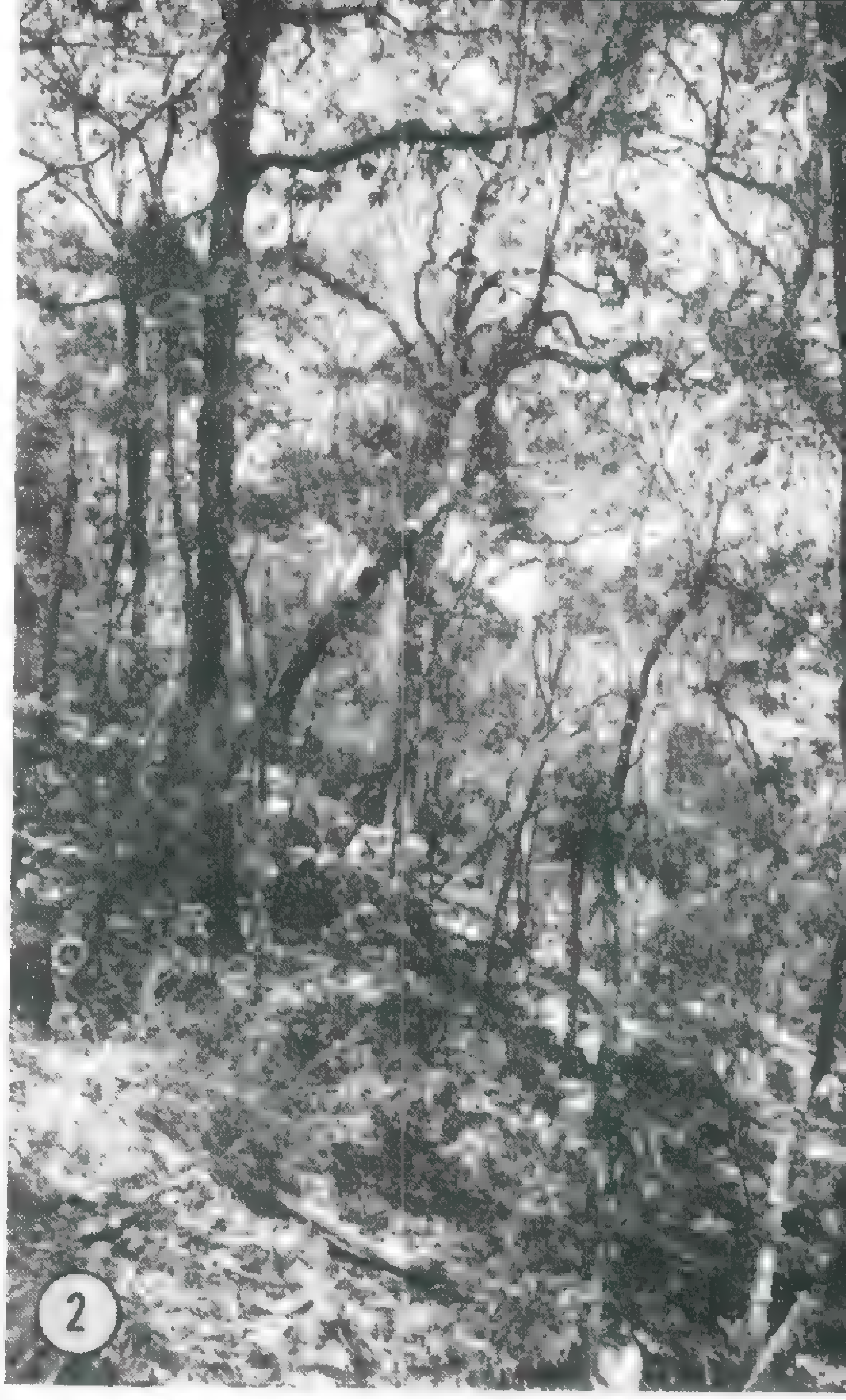


Figure 1. Moss-covered Podocarpus forest near Rancho del Cielo. Contrary to popular opinion, orchids are scarce in such moist areas. Figure 2. Mixed hardwood forest at Rancho del Cielo. Isochilus, Stanhopea and *Lycaste aromatica* are frequent in this sort of vegetation.

winter and very hot during the summer. At this elevation, near the Río Sabinas (named for the bald cypress along its banks) we found *Oncidium ascendens, Oncidium carthaginense, Epidendrum lividum* and *Spiranthes acaulis,* the last having large green flowers. These are all truly tropical species, which were not found at higher and cooler elevations.

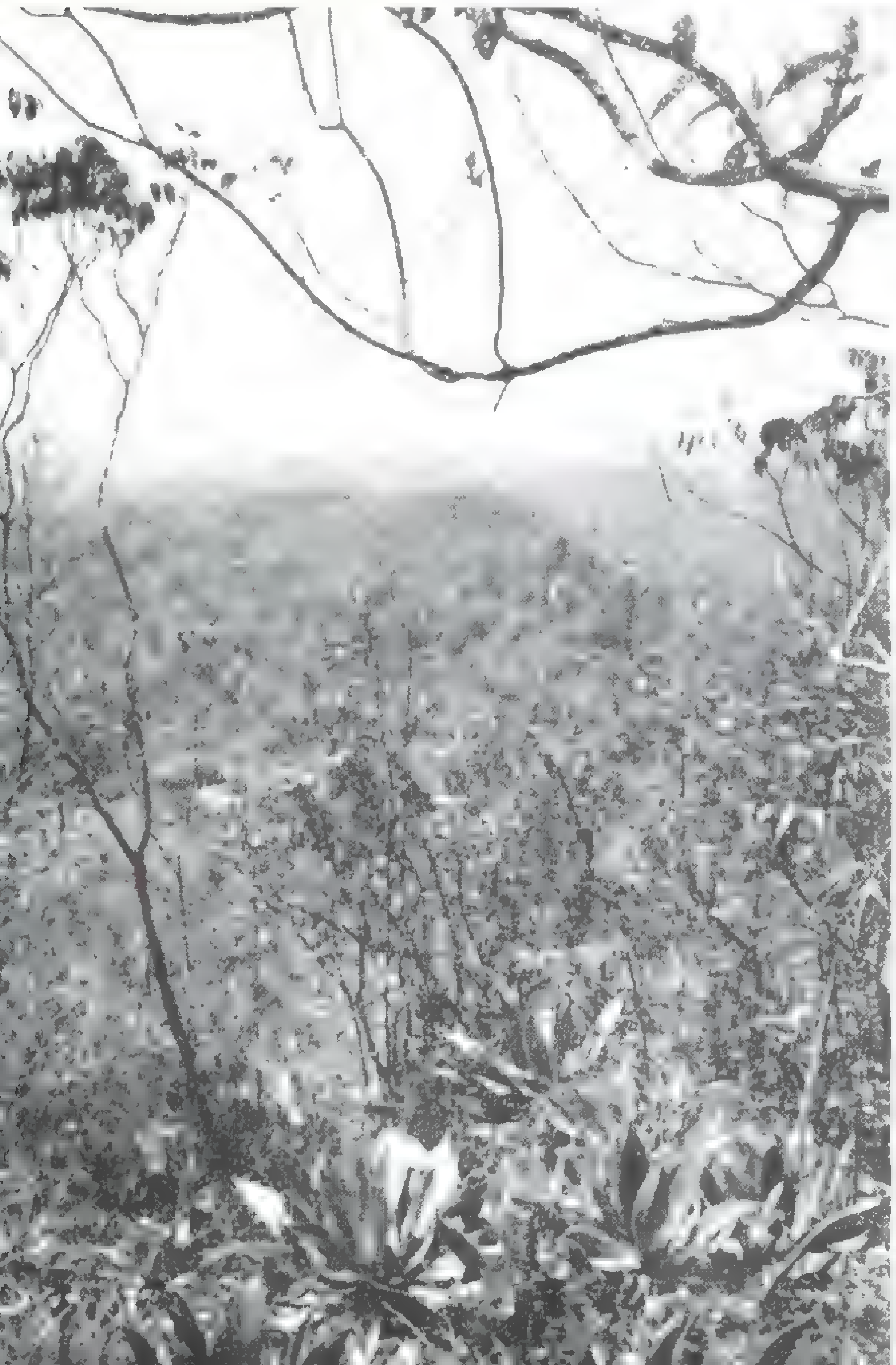
The vegetation near Rancho del Cielo (about 3,200 feet elevation) is highly varied, depending on the exposure to the clouds and on the water-holding capacity of the soil or rock. The forests here are noted for their peculiar combination of tropical and temperate tree species and one finds such familiar northern species as redbud, sweet gum, hickory and beech along with tropical palms and begonias. The wettest sites are dominated by *Podocarpus reichei,* a broad-leaved tropical conifer-relative. These humid sites are poor orchid territory. One finds an occasional *Stanhopea tigrina* or *Calanthe mexicana,* but very few epiphytes occur near the ground or on the rocks, and only a few species occur in the treetops. In slightly drier forest, such as shown in Figure 2, one may find numerous Stanhopeas, *Isochilus linearis, Lycaste aromatica* and *Epidendrum cochleatum.* The very best areas for orchids, however, are the well-drained, rocky hilltops, where the vegetation is open and orchids find the optimum combination of sunlight and moderate moisture. On "North Hill," adjacent to Mr. Harrison's ranch, we found at least 16 species of orchids, including *Arophyllum spicatum, Cyrtopodium punctatum, Epidendrum mariae, Lycaste aromatica, Laelia anceps* and *Bletia purpurea,* which was then flowering among the cactus and agaves on the hilltop. *Epidendrum cristatum* formed huge clumps below the crest of the hill and seemed to be fussy about its habitat, as the plants formed a narrow band about the hill.

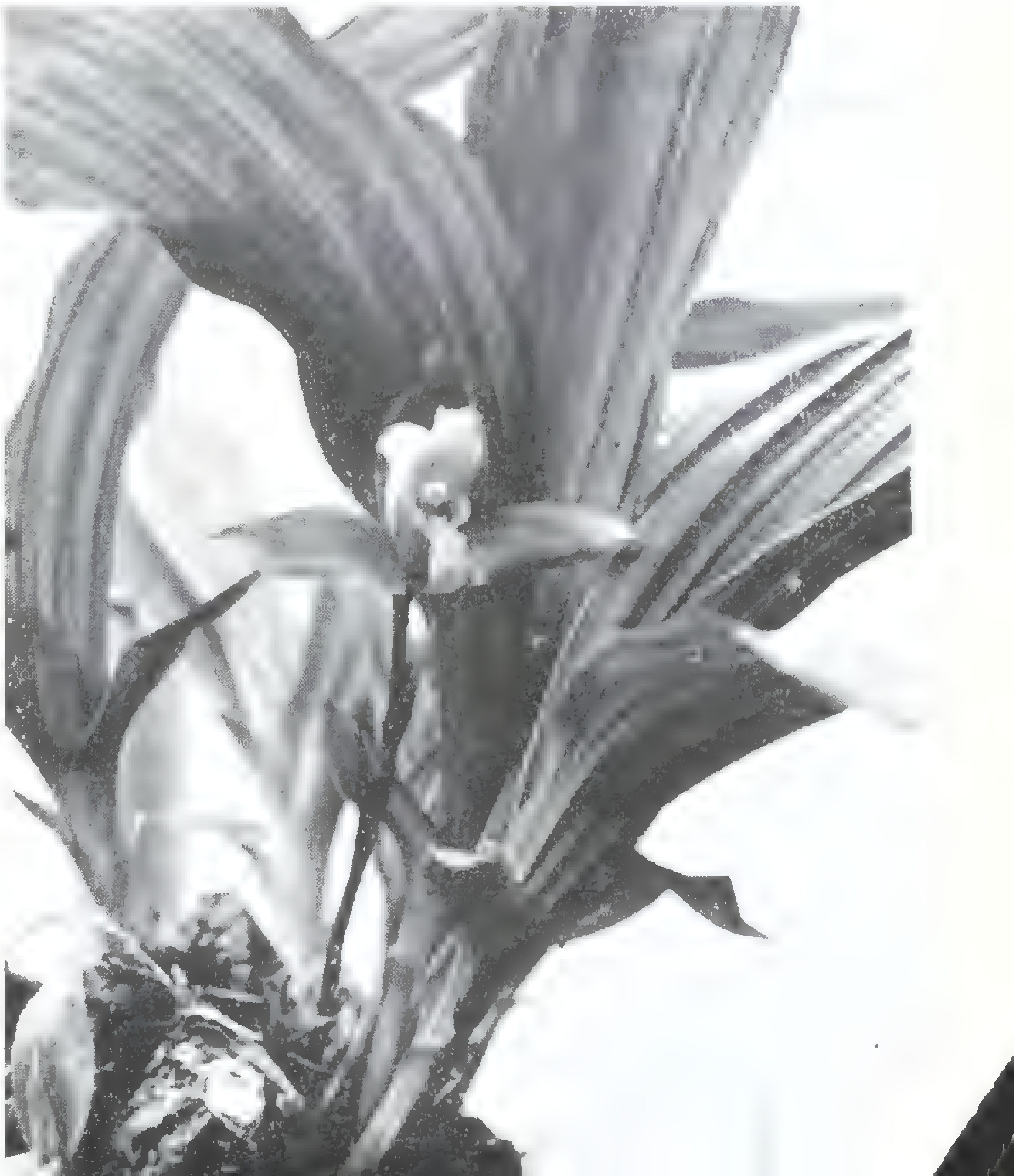
By hiking up to higher elevations one finds oak and pine forest, with several species of orchids. At the time of our visit *Spiranthes eriophora* was in flower, with beautiful yellow-centered white flowers about an inch across. *Epidendrum cyanocolumna* is locally common on oaks, and I found corms of Crybe and Govenia in the pine forest. It was evident that many terrestrial species would flower in the summer.

Frank guided us to the "Rock Pile," a complex ridge of cliffs and canyons southwest of the ranch, where I sought a distinctive Lycaste which Frank had reported. Since we could not find it there, he gave me a plant from his garden; it is now flowering (mid-June), and proves to be *Lycaste deppei*, with green sepals and a bright yellow lip flecked with red. Frank told us of several other species which we were unable to locate in the short time available. One Stanhopea is described as having the flowers very dark, "nearly black," while both yellow- and white-flowered Govenias were reported. A single plant of *Laelia speciosa* was growing poorly on Frank's stone fence, and it is reported to be common in oak forests near Joya de Salas, which was too far to hike in a day.

On another occasion I hiked south toward Gómez Farías and soon entered

Figure 3. The crest of "North Hill," richest orchid-collecting site found, where *Epidendrum mariae*, *Laelia anceps* and *Bletia purpurea* were among the sixteen orchid species collected here.
Figure 4. *Lycaste deppei,* from near Rancho del Cielo, showing its first flower in cultivation.





a drier forest with scattered large oaks towering above the remaining vegetation. As the only orchids were found in these huge trees, very little collecting was possible. I found a single plant of *Lycaste deppei* on a fallen tree and Isochilus and Arpophyllum were abundant. In one tree I was able to see *Epidendrum conopseum* growing far out on the lower branches, but the plants could not be reached.

THE DISTRIBUTION OF EPIDENDRUM CONOPSEUM

As *Epidendrum conopseum* is our northernmost epiphytic orchid, its geographic distribution is of special interest. In "The Orchidaceae of Mexico," Dr. Williams described *Epidendrum conopseum* var. *mexicanum* from the slopes of Mt. Popocatepetl in central Mexico. At that time *E. conopseum* was not known from other parts of Mexico, and its distribution seemed, at best, peculiar. Actually *Epidendrum conopseum* is widely distributed in northeastern Mexico and is the commonest orchid in some places, as in the isolated Sierra de Tamaulipas, northwest of Tampico. Its known distribution in Mexico is shown in Figure 5. I have not been able to see the specimens from Mt. Popocatepetl, but the plants from northeastern Mexico do not differ appreciably from those in the southeastern United States, so that they should not be called "var. *mexicanum*." The distribution of *Epidendrum conopseum* suggests that it is the only epiphytic orchid to have entered this country from Mexico. The other epiphytic species are all West Indian and probably reached Florida from Cuba or the Bahamas (though some of them also grow in Mexico). Since *Epidendrum conopseum* ranges north to North Carolina, it cannot really be called "tropical."

HOW FAR NORTH

We know that *Laelia autumnalis*, *Oncidium longifolium* and *Epidendrum microbulbon* all reach the state of Sonora in western Mexico. This is actually farther north than southern Texas, but we really do not know how far north these orchids range in the mountains. They may grow much closer to Arizona than we realize. On the east coast, Rancho del Cielo is thought to be a northern outpost for many tropical species, but *Epidendrum conopseum* ranges to within 130 miles of the Texas border, and other epiphytic species may also range northward from Rancho del Cielo. A zoologist recently reported spider monkeys west of Ciudad Victoria, which certainly suggests that there is a patch of tropical forest some 40 or 50 miles north of Rancho del Cielo and on this side of the Tropic of Cancer.

The orchid-hunting tourist will find easier and better collecting in San Luis Potosí or Veracruz, but there are many orchids within a couple of hundred miles of the Texas border, and much more study is needed in this area. About two-thirds of the species we found are "new records," and many of these are among the commonest orchids there.

Orchids collected near Rancho del Cielo (+ = not previously reported from the state of Tamaulipas):

+*Arpophyllum spicatum*
+*Bletia purpurea*
+*Calanthe mexicana*

+*Catasetum integerrimum*
Cyrtopodium punctatum
+*Crybe rosea*
Epidendrum (Encyclia) alatum
+*Epidendrum (Encyclia) candollei*
Epidendrum (Encyclia) cochleatum
Epidendrum (Encyclia) cyanocolumna
Epidendrum (Encyclia) lividum
+*Epidendrum (Encyclia) mariae*
+*Epidendrum (Encyclia) varicosum*
+*Epidendrum conopseum*
+*Epidendrum cristatum*
Epidendrum ledifolium
Govenia sp.
Isochilus linearis
+*Laelia anceps*
Lycaste aromatica
+*Lycaste deppei*
Malaxis corymbosa
+*Malaxis majanthemifolia*
Oncidium ascendens
Oncidium carthaginense
+*Oncidium longifolium*
Pleurothallis carioi
+*Pleurothallis ghiesbreghtiana*
+*Pontheiva ephippium*
+*Prescottia tubulosa*
+*Scaphyglottis pumila*
+*Spiranthes acaulis*
+*Spiranthes elata*
+*Spiranthes eriophora*
+*Spiranthes schaffneri*
+*Stanhopea tigrina*
+*Tropidia polystachya*

Species reported but not found:

+*Laelia speciosa*
Stanhopea sp.

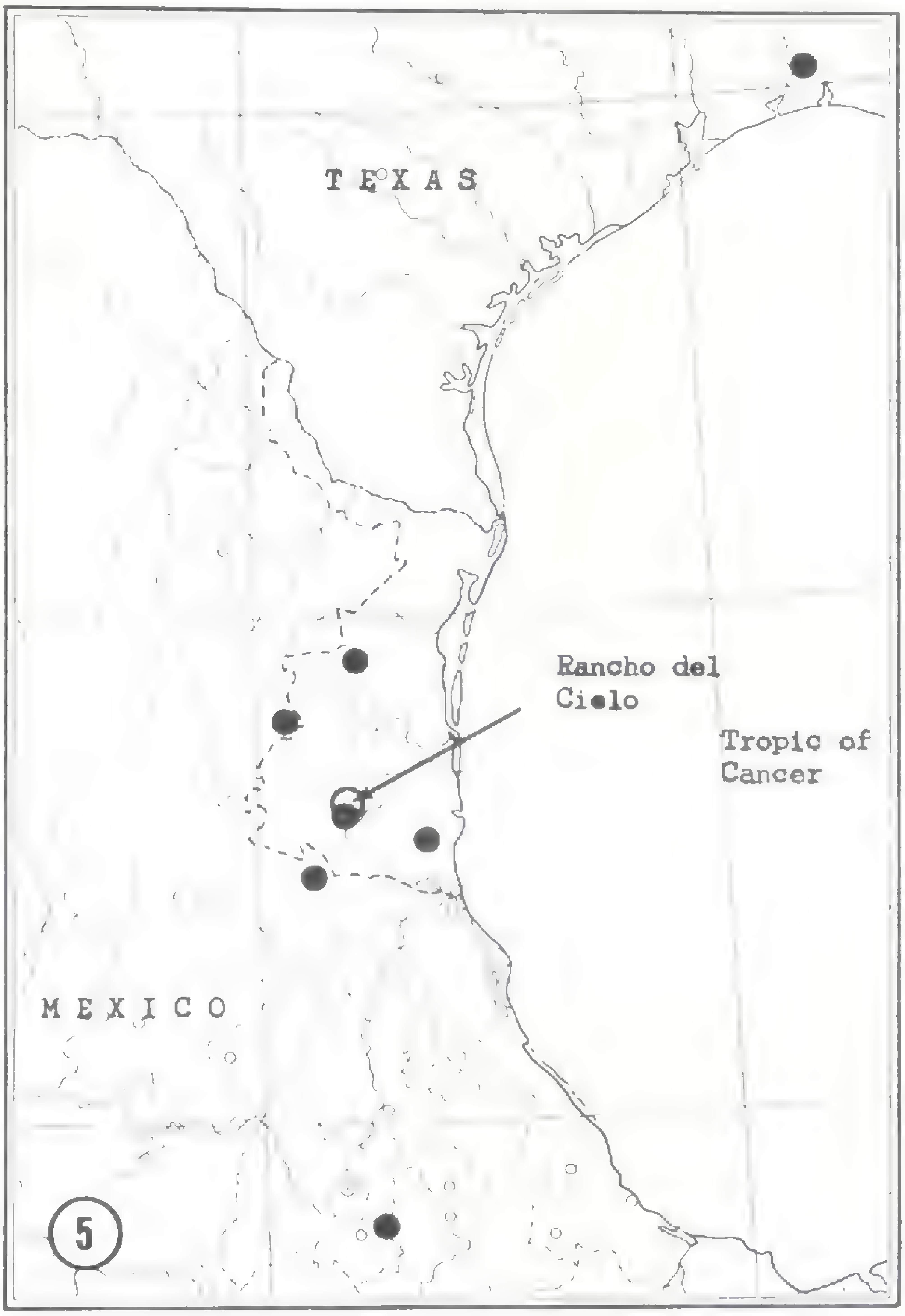


Figure 5. The location of Rancho del Cielo, and the distribution of *Epidendrum conopseum* in Mexico (shown by black dots). The nearest U. S. locality for this species is shown in western Louisiana. It is expected that it might be found in eastern Texas.

—Reprinted with permission from *American Orchid Society Bulletin*, December, 1961.

FRIENDS OF THE GARDEN NOTES

As this BULLETIN goes to press, the Garden switchboard and the Friends office are still reeling from a deluge of telephone calls following Dr. Went's letter in January inviting Friends to be gastronomical guinea pigs for an experimental Indonesian dinner at the Floral Display House. The original plan was to hold one dinner for fifty or sixty people, on February 21, with another date reserved the next night just in case of an overflow response. Well—at this writing *four* additional dinners have been scheduled for a total of 360 people and all reservations for them almost immediately taken, and a waiting list of over 350 is still growing. Neither Dr. Went nor the Friends officers had anticipated anything like this much enthusiasm for Indonesian food. Nor had the obliging Dutch-Indonesian gentleman, Mr. Henry Falkenberg, whose culinary skills make the whole experiment possible. Expanding the original dinner party into a three-week-long marathon of cooking, serving and washing dishes (without a kitchen) presents some interesting logistical problems but with their usual aplomb the Garden staff and Friends volunteers are meeting the challenge, and we have no doubt that by February 21 a serene Oriental calm will reign in the Flower House while the first fortunate diners are sampling gado-gado with peanut sauce.

⁂

Mrs. Dan Sakahara's course in classical Japanese flower arranging will be offered by the Friends for six sessions starting on March 7. The time is 10 A. M. to noon, the fee is $10 for Friends, $12 for non-Friends, and flowers are provided. You should bring the following equipment with you: note pad and pencil; flower clippers or shears; eight-inch glass or metal pie plate as a container. Registration for the series is limited to twenty students, so it seems probable that not everyone interested can be accommodated. However, like many Friends projects these days, this is a "pilot" undertaking, designed to measure interest, and if the response is great, an effort will be made to provide additional classes.

⁂

A notice of the free First Monday Lectures was mailed to all Friends in January, but the remaining lectures are listed below, in case anyone has mislaid the announcement:

March 5: Dr. and Mrs. Henry Andrews—"Byways of India." Slides, native handicraft objects and informal talk about the Andrews' recent year in India.

April 2: Dr. James A. Duke—"Useful Plants of Central America." Dr. Duke's many expeditions to this area have given him an intimate knowledge of the many plants and their uses in the American tropics.

May 7: Dr. Robert L. Dressler—"MBG Expeditions to Northeastern Mexico." A veteran collector of wild orchids, Dr. Dressler will report on his latest expeditions.

June 4: Paul A. Kohl—"A Garden's Spring Parade." The Garden's chief Floriculturist will give a colorful presentation of choice plants in St. Louis.

All lectures are at the Museum Building at 8:00 P. M. Coffee is served at 7:00 P. M.

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Robert L. Dressler, Taxonomist and Editor of the Annals

James A. Duke, Assistant Curator of the Herbarium

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Trifon von Schrenk, Associate Curator of the Museum

Robert E. Woodson, Jr., Curator of the Herbarium

SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 10:00 P. M. Tower Grove House is open daily from 9:00 A.M. to 5:00 P.M. (April through November); 10:00 A.M. to 4:00 P.M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

March 1962
Volume L
Number 3

COVER: The graceful boughs and delicate pink and white flowers of the saucer magnolia *(Magnolia soulangeana)* are a traditional early symbol of spring in St. Louis.

CONTENTS

Report of the Director for 1961

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Guest Editor for this issue: RANLET LINCOLN.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Volume L No. 3 March 1962

MISSOURI BOTANICAL GARDEN REPORT OF THE DIRECTOR FOR 1961

FRITS W. WENT, Director

The year 1961 was one of steady progress for the Garden in general, but the center of interest remained the Climatron. Not only botanically and horticulturally has it lived up to and even surpassed expectations, but also as a public attraction it has been fully successful. During the first twelve months of operation the approximately 400,000 persons who visited it contributed \$96,912 in admissions. Since the individual admission fee is \$0.50, for groups of 20–100 \$0.35, and for over 100 \$0.30 per person, almost half of all visitors entered free. These are all children under 14, students in groups, and members of the Friends of the Garden.

Growth of most plants is excellent in the Climatron, and trees like *Ochroma* and *Grevillea robusta* have grown 25 feet or more in 1961. The special light regime (the Climatron is open to the public 3 nights each week, with concomitant long-day light conditions, followed by 4 short days) causes some interesting plant responses, such as strong retardation of flowering of poinsettia, inhibition of flowering in coffee trees (they are both short-day plants as far as flowering is concerned), continuous flowering of *Cestrum nocturnum*, which normally flowers only in October (because it needs a succession of long days followed by some short days before it initiates flowers).

The orchids growing on the artificial trees are developing better than those in pots, and are starting to give these trees a very natural look. This is partly due to the regular feeding and partly because they are placed in parts of the Climatron most closely resembling the climate of their natural habitat.

The Victoria pool with the underwater walk (the Aquatunnel), the cost of which was contributed by the Women's Association, has continued to be troublesome. To prevent excessive algal growth on the plexiglas of the Aquatunnel we first put an algaecide in the water, which was not toxic for fish, but killed all higher plants in addition to the algae. Upon dilution of the algaecide, water lilies survived, but most plants grew poorly because of lack of nutrients. Pistia was chlorotic until small amounts of chelated iron were added. Growth of most water plants picked up upon supply of 10 pounds of potassium nitrate; when a mixture of KNO_3 and K_2HPO_4 was applied, growth of algae increased. Now a new regime of alternate doses of nitrate and phosphate keeps algae down. Fumigation of the Climatron with parathion resulted in the death of most fish. Toward the end of the year a special filter system was installed to remove planktonic algae. This has been paid for by the Horticultural Council and it is most effective. Thus, through research, trial and error, and generous contributions from our supporting organizations, a remarkable new feature of the Climatron has been added.

A nutrient fog box was installed to demonstrate the growth of roots. Another feature, the glass window with soil behind it, was effective in showing root development in soil.

Upon the death of Dr. Roland Read, friends and family contributed to a fund for which an orchid demonstration table was installed. On one side it displays on several levels the best of our flowering potted orchids, and on the other side the small-flowered orchid species are demonstrated under a set of special lighted magnifying glasses.

The Climatron was often in the news, with full or double-page color pictures in *Life* and *Saturday Evening Post*, in *Post-Dispatch* and *Globe-Democrat* Sunday editions, and in untold other publications, such as the Rohm and Hass *Reporter*. It has been used repeatedly in national advertising to demonstrate progress in St. Louis. It is rapidly becoming a landmark of St. Louis.

A signal honor was paid to Murphy and Mackey, the architects of the Cli-

The Garden Gate sale held by the Women's Association at Famous-Barr, Clayton.

PHOTO P. A. K.

matron, when they received the Reynolds Memorial Award for the building anywhere in the world "in which aluminum was used most imaginatively." It is understandable that we believe it was highly appropriate that this very significant prize went to the Climatron, the first building in the United States designed by American architects to which this award was given. But it is impossible to think of a case in which aluminum was so definitely indicated as building material, and where it was so effective and indispensable.

The unique atmosphere of the Garden is used more and more for social occasions, as a prelude to what can be done in the future when proper facilities have been constructed for receptions, dinners and parties. The Floral Display House was used with great success for dinner parties, of which that of the Trust Division of the Bar Association in August should be mentioned specifically. Before the vegetation in the Climatron had become too dense, an evening party was held in it. The Tower Grove House, so beautifully restored by the Historical Committee (the kitchen is the last addition to the restored rooms), was the scene of several receptions and dinner parties. The old-time elegance of Shaw's country residence lends itself perfectly to such occasions and it must give the visitors, who have come in greatly increased numbers, a feeling that it still is a living-and-lived-in link with the past. It seems appropriate that the hospitality of the Shaw era is thus revived.

In anticipation of restaurants in the Garden, which are envisaged in the master plan, a set of vending machines dispensing cold and warm drinks, sandwiches, ice cream, candy bars and cigarettes, has been installed on the balcony in the Floral Display House. They definitely serve a good purpose since they are used extensively by the public.

Other new ventures in the Garden are live concerts, of which the first one in the Floral Display House, by the Rosen Quartet, was a success; and also recorded concerts and other music in the Climatron and the Floral Display House, produced regularly with newly installed recording and reproducing equipment. The enthusiasm and untiring efforts of Mr. Samuel Shure have been mainly responsible for the new music reproducing system.

During the year a turf grass research program was started at the Garden with Raymond Freeborg as specialist. The St. Louis Turf Grass Research is turning its funds over to the Garden, which administers them, and in turn the Garden guarantees the salary of Freeborg and supervises the general research program.

The annual Systematics Symposium was again held at the Garden and was more successful than ever; in fact, the popularity of this annual affair for all taxonomists of the Midwest now exceeds the facilities of the Garden; if we want to continue to play host to this event we will have to expand our meeting rooms.

The director gave many lectures during 1961. In addition to his regular course in autecology at Washington University, he gave a similar course at the University of Georgia, Vanderbilt University, Eastern Illinois University and the University of North Carolina. In addition he gave lectures on the Climatron, the Role of Botanical Gardens, Circadian Rhythms, Climate Control, Desert Ecology, Thunderstorms, Air Pollution, and other subjects, before lay and professional audiences in a dozen different states and countries. For a period of a month he was in Israel to study the feasibility of establishing a phytotron there and to advise the government accordingly. In addition to a thorough study of biological research laboratories, Mrs. Went and he visited all the major areas in Israel, from the Negev and the Dead Sea to Upper Galilee and the Jordan Valley, but most of the time was spent in Jerusalem. Due to abundant rain in several areas there was a rich display of flowers, and many botanical observations could be made.

The director received the honorary membership of the German Botanical Society and he was elected president of the American Institute of Biological Sciences, representing the majority of American biologists He visited many Botanical Gardens, such as the New York Botanical, the Brooklyn Botanical, Longwood, the Denver Botanical, the Tel Aviv Botanical, the Callaway Gardens, Pine Mountain, Georgia, and the Los Angeles Arboretum.

In addition to his administrative duties, Hugh Cutler, Executive Director, continued his research on useful plants, supported by a National Science Foundation grant. Michael Wynne, a botany student at Washington University, continued as technical assistant. In March, Dr. Cutler took part in the conference of Directors of Systematic Collections at San Francisco. During parts of July and August he studied useful plants in central Mexico and in the collections and experimental fields of the Escuela Nacional de Agricultura and the Universidad de México, and participated in the Pecos Conference at Nueva Casa Grande, Chihuahua. During October he lectured and conducted seminars for the botany, anthropology and agronomy departments of the University of Nebraska.

From January through April Edgar Anderson was a Fellow of the Center for Advanced Study at Wesleyan University, Middletown, Connecticut. For the remainder of the year he was in residence at the Garden and has spent most of his time with collections of economic plants and with writing. Since October he has been studying the succession of bloom in the Climatron and has kept a detailed week-by-week record of the plants in flower there.

THE HERBARIUM

ROBERT E. WOODSON, CURATOR

UNPRECEDENTED activity in the field has distinguished the year 1961 for the Herbarium staff. During the summer both Dr. Duke and Dr. Dwyer collected in Panama, and Dr. Dressler in Mexico; from September until the last of the year Dr. Dodson was in Ecuador. Dr. Woodson was again on the roads between western Texas and Quebec collecting interminable data on butterflyweeds; just before the close of the year, Dr. Dodge rather unexpectedly found himself in Antarctica!

Less spectacular, but even more important to the welfare of the Missouri Botanical Garden, were the activities of Mrs. Barbara Mueller, Mrs. Nina Behrens, Mr. Gordon Hunter and Mr. Jack Wasinger in the Herbarium office and in the Herbarium itself. A total of 10,337 specimens were mounted and incorporated in our collections, bringing the estimated content of the Herbarium to 1,769,618 sheets. 8,362 sheets were forwarded as loans requested by other institutions; in the same period the Missouri Botanical Garden received on loan from other museums 3,507 specimens for the research of our staff and students. 3,977 herbarium specimens and 73 type photographs were received on exchange from other museums and we reciprocated with only 997 specimens, which must be an all-time low. We have on hand, however, an almost unprecedented backlog of duplicate herbarium specimens with which we hope to exchange profitably during 1962.

Without adequate additional space, however, there is very little incentive for expanding our collections. It seems to me that this has been the chief message of the curator's annual reports as far back as I can remember. Long arrested growth inevitably leads to decline and death, and this is the direction in which we are headed. It is an unpleasant topic which cannot be suppressed within the family, for the neighbors—meaning the national and international scientific communities—already know of it and are expecting us to take corrective measures, toward which they already have volunteered aid.

Without this overcast of clouds, the future would appear brighter than for any previous year within memory. We have a larger staff than ever before, combining vigor and experience to really a remarkable degree (and which, thanks to government research subsidies and salaries shared by Washington University, costs the Garden less than a single staff member in the "Good Old Days").

Dr. Robert E. Woodson, Jr., Curator, and Professor at Washington University, has had to devote most of his time to teaching advanced classes at the University and supervising research students at the Garden. He has continued his study of population problems in the butterflyweed, *Asclepias tuberosa,* and the flora of Panama, both supported by grants from the National Science Foundation.

Dr. Carroll W. Dodge, Mycologist, and Professor at Washington University, like Dr. Woodson, has been chiefly involved in teaching, but continues as one of the world's leading authorities on lichens, particularly of Antarctica, for which he receives support from the National Science Foundation. In November Dr. Dodge visited the South Polar area under the auspices of the U. S. Antarctic Research Program.

Dr. James A. Duke, Assistant Curator, and Assistant Professor at Washington University, has borne, besides his class at the University, the brunt of work on the Flora of Panama, three fascicles of which were issued during the year. He was also sponsored by the U. S. Army on a one-month expedition to eastern Panama during the summer and collected a good quantity of dried and living plant specimens. There is a strong likelihood that such Government-sponsored expeditions will be considerably expanded in the near future and that the younger members of our Herbarium staff will be increasingly involved as a result of our long-range tropical program.

Dr. Robert L. Dressler, Taxonomist, and Assistant Professor at Washington University, has continued his classes at the University while editing the ANNALS OF THE MISSOURI BOTANICAL GARDEN and continuing his research on orchids (which inevitably involves collecting trips to Mexico). One of Dr. Dressler's most important functions is his management, under the National Science Foundation, of the Annual Symposium on Systematics held at the Garden each fall. On October 20–21 of 1961, the Eighth Annual Symposium on "The Population Concept in Systematics" attracted more than 275 participants from 64 colleges and universities from coast to coast, plus a few visitors from overseas.

Attendance at our Annual Symposium has been a "must," particularly for graduate students of institutions within week-end traveling range, and we never fail to find contingents from the Universities of Kansas, Michigan, Indiana, Illinois, Wisconsin, and elsewhere converging in sizeable convoys. (Parenthetically: The National Science Foundation is particularly proud of our Annual Symposium and would gladly sponsor others elsewhere in this country, but has been unsuccessful in doing so, since the prospective hosts are fully aware—from observing us—of the responsibilities and inconveniences involved in such mass hospitality!)

Dr. Callaway H. Dodson, Taxonomist and Curator of Living Plants at the Garden, spent the first half of 1961 assisting with preparation of the Flora of Panama. In September and continuing through the remainder of the year he was in Ecuador engaged in field studies of orchids, sponsored by the National Science Foundation. Dr. Dodson brought home with him 2000 numbers of dried specimens, 350 living species of orchids, 75 miscellaneous living plants and 25 lots of seed for the Climatron. (Dr. Dodson wryly adds that, although the dried specimens proved to be "immortal, as expected," mortality was high among the living—emphasizing the continued need for good plant propagators at the Missouri Botanical Garden.)

Dr. John D. Dwyer, Research Associate and Professor of Botany at St. Louis University, has continued his research on Leguminosae in our Herbarium. During the past summer he collected in Panama with assistance from the U. S. Navy and our Flora of Panama funds from the National Science Foundation, bringing back with him a splendid collection of herbarium specimens.

During five months of the year the Herbarium was host to Professor Richard W. Holm of Stanford University, and for one month to Professor Philip A. Munz of Rancho Santa Ana Botanic Garden, Claremont, California. It was a homecoming for Dr. Holm, who received the greater part of his undergraduate and graduate training at Washington University and the Missouri Botanical Garden.

Graduate students of Washington University currently using the facilities of our Herbarium for their research, with the respective topics of their study, include: Gordon E. Hunter *(Saurauia)*, Phung Trung Ngan *(Wrightia)*, Howard W. Pfeifer *(Aristolochia)*, Leonard Thien *(Orchidaceae)*, Michael Wirth *(Oncidium)*. Dr. William C. Burger, who received the Ph.D. at the June, 1961, Commencement of Washington University, is now on the faculty of the Imperial College of Agriculture, Jima, Ethiopia. He reports the country fascinating and promises to send duplicates of his specimens to our Herbarium, which includes probably the best and largest collection of African plants in this country.

LIBRARY REPORT FOR 1961

GEORGE VAN SCHAACK

In emphasis the library report for 1961 differs but little from the one for the previous year. Use areas and process areas in the library are just woefully insufficient. Staff is also insufficient, but adding even one more member would pose a really difficult problem of finding a place for him to work. When space for processing gets crowded or limited, books tend to accumulate in piles, of which, naturally, only the topmost book is immediately available. Significant amounts of time must be devoted to repeated reshuffling to get wanted items and to look for misplaced ones, not to mention the wear and tear on the books themselves. In his tour of several eastern natural history libraries at Christmas time, the librarian found nearly everyone complaining about lack of space; but nowhere was the crowding nearly so critical as in our own library. Expanded quarters simply must become available very soon if the library is not to be clogged by its treasure.

Search for at least one new trained staff member continued through the year without success. However disappointing, this was not surprising. At the Cleveland ALA Conference in July over 500 professional library positions were posted as available, while only a couple of dozen librarians were looking for positions. Most of these applicants were already employed. Our type of library always has more than usual difficulty in finding suitable staff members; not only is some interest in botany desirable and at least some basic knowledge of it almost indispensable, but a knowledge of foreign language is also helpful, since well over half of our publications are in foreign languages. The librarians don't have to read these foreign books, of course, but they at least must deal with their titles. While there are certainly people of the required qualifications, for every such person there are many positions available. Although most good librarians will accept part of their salary in the form of a more interesting job instead of a salary increase, they do tend to accept positions that pay well and offer comfortable working quarters. We have already made the decision to try to attract librarians by a reasonably good salary, but our crowded quarters definitely caused one of our (only) two good applicants to refuse our offer.

During the year we had the benefit of continued part-time work by a young man who for several years has been excellently repairing our books, binding pamphlets, and making cardboard slip cases. Of this kind of work there is no end—and there must be no end. Most of our material is not expendable as is, on the contrary, a great deal of popular material in a public library, for example. We must preserve what we have more or less indefinitely. This means continuous attention to repair.

The influx of exchange publications notably increased during the year. The number of new non-serial titles catalogued was 179. The number of books bound was 644. A significant addition to the bibliographical tools was the copy of the United States Department of Agriculture's *Botany Subject Index* recently printed in book form in 15 large volumes This is a subject index of over 300,000 entries, covering publications in the whole field of botany during approximately the first half of the 20th century. With our own catalogue almost devoid of subject entries this should be a most useful supplementary aid. Regret must be expressed, however, that the government believed it too expensive to continue this index after 1952.

EDUCATION PROGRAMS

KENNETH O. PECK, Instructor

Children's Activities—Saturday programs, now in the third year, continued to draw good attendance except for a short period in the early fall. Programs are held every Saturday morning from 10 to 11:30, and each one is designed so that every child can do something. Planting seeds or bulbs, making Christmas decorations from greens or seed pods, rooting cuttings, making miniature dish gardens or doing experiments are some of the most popular activities and help to teach basic ideas in natural science. Mr. Peck was aided in all children's activities by the Assistants Council, five children who have been outstanding in their work in Garden programs over the past few years. Members in 1961 were Fred and Jean Bardenheier, Marcia Eickmeier, Stanley and Wesley Ulrich.

The Pitzman Summer Nature Program improved again in its fourth year. More than half of the 550 children registered for the two five-week sessions completed their work for certificates of achievement. Members of the St. Louis Audubon Society conducted the classes and field trips on Birds, while three other courses, Trailfinders, Plants and Man, and Man's Enemies, were conducted by Kenneth Peck and two Washington University students, Pat McCue and Brian Gordon. Don Mandell joined the teaching staff for the second session. Forty-five outstanding children were selected to work on eight Junior Research Teams and conduct study on plant growth, algae, photobiology, plant collecting and identification. Guidance was also provided for children who wanted to work on their own projects, such as the collection and identification of leaves and insects. The continuing interest in the Pitzman Program indicates that today's youngsters are still interested in the natural sciences and are willing to spend part of their summer days studying the world about them.

Plant Science Classes—Last year many classes from schools near the Garden came to the Garden for programs in plant science. These programs, of two meetings each, are graded to provide a stimulating introduction to plant science. Fifth and sixth grades study identification and the major kinds of plants. The seventh and eighth grades work on the structure of individual plants and the organization of plant communities. Now that this program has worked so well with neighborhood schools, we anticipate requests for reservations from schools in other areas. Mrs. Florence Guth (telephone TOwnsend 5-0440) is in charge of reservations and information for all classes and tours.

Tours—For many years a group of trained Volunteer Guides, under the direction of Mrs. Paul S. Britt, has been conducting tours of visiting groups of clubs, business organizations and classes. The number of such tours has increased greatly in the past year and the number of Volunteer Guides has been increased. The Climatron is still the most popular spot on the tours.

Self-guiding Trails—More than 35,000 copies of the guide to the Tree Trail were requested at the Main Gate. A completely new set of descriptive labels, prepared and placed by Mrs. Betty Samuelson for the Nature Trail and some of the wilder parts of the Garden, made it unnecessary to use printed instructions to follow this trail to the wilder parts of the Garden.

Adult Courses—Clarence Barbre continued to teach his popular courses in Bulb Forcing, Plant Propagation and Spring Horticulture Other courses in botany and horticulture were taught by Robert Dressler, Edgar Evinger, Ray Freeborg, Robert Gillespie, Norton Nickerson, and George Van Schaack.

Special Courses—A five week summer course, Evolution in Plants, was given by Frits Went, Hugh Cutler and Calaway Dodson to a group of exceptionally able high school students for the Mark Twain Summer Institute. A course in college botany was given at the Garden during the fall semester at the request of the St. Louis Baptist College. Lectures were given by Robert Gillespie, Robert Dressler and Ernest Bibee, and laboratory work was supervised by Fuad Safwat.

* * *

CLIMATRON AND GREENHOUSES

LADISLAUS CUTAK

The Climatron has achieved an authentic and captivating jungle background in its first year of operation. Balsa trees which were only two feet high when planted in October 1960 are now 30 and 40 feet high, and likewise both the edible and ornamental bananas have grown from single stalks to massive clumps. There are at least a thousand different kinds of plants growing in the Climatron and new additions are being made daily.

Significant transplants from other houses included a large banyan tree which is now spreading its leafy canopy near the entrance court. A year ago it was a 12-foot bare trunk with only a few closely-pruned branches. Several leaf-holding Philodendrons were set out and are now producing massive deeply-cut leaves. The largest of them is *Philodendron Mello-Barretoanum* from Brazil. A 30-foot *Brachychiton Bidwillii* was also successfully transplanted and already has a dense head of palmately-lobed ornamental leaves.

In early August Ernest A. Bibee was hired as assistant to the Greenhouse Superintendent. Formerly employed in Florida as a nurseryman, he is a thoroughly capable grower and has greatly aided in management of the Climatron plants. He brought with him over 80 species of important plants for the Climatron, among them such important fruit and nut trees as the cashew, carambola, cocoplum, Ceylon gooseberry, Java plum, tropical almond, calabash tree, and various citrus relatives.

The Hawaiian area, mostly bare in early 1961, received special attention and is now thickly populated with many species of Hibiscus, Plumeria, Jacaranda, Dracaena, and other plants found in Hawaiian gardens. Nearly 100 different kinds of Hibiscus were donated by Henry Walter, Horticulturist of the Oklahoma City Parks Department. Ruby Bachmann of Bonita Gardens in Miami dispatched a hundred colorful crotons for the Hawaiian Garden and his "Mona Lisa" has attracted a great deal of attention. This croton has a preponderance of yellow in its leaves and when grown to perfection is one of the most outstanding of foliage plants. The banana plantation has taken on a lush appearance and should start producing its first crop shortly. The banana plants by the waterfall have already borne fruit.

The bamboo grove is coming along nicely with three types represented: *Bambusa*, *Gigantochloa*, and *Guadua*. Trellises for the bouganvilleas were erected in April and will form a spectacular archway in back of the Hawaiian area at flowering time. The vines are growing vigorously, but so far they have flowered sparingly due to the dampness caused by the mist nozzles. The condition has now been remedied. Two 11-foot para rubber trees were donated by U. S. Rubber Co. and were set out at the base of the mountain near the Climatron entrance. The mountain presents characteristic Afro-Asiatic vegetation growing up its slopes and some of the plants only a few feet high when first planted are now assuming treelike proportions. The ground underneath them is being cleared and prepared to receive ferns, terrestrial orchids and creepers.

The topography in the Climatron is such that it will lend itself to changes and various improvements for years to come. Monotony will thus be avoided and visitors will certainly see somthing different on each visit. The creation of a lake was one of the big projects during 1961. The pool was waterproofed on February 1 and shortly afterwards was tested for leaks. When none were found, 58 tons of Mississippi sand were dumped into the pool and 8 tons of silica sand spread on top of it. Underwater planting was first attempted in March, but it proved unsuccessful. Fish were added later and in May the first tropical water lilies were introduced. The Nymphaeas grew remarkably well and have been producing flowers ever since. Algae proved to be a headache until the water lilies became established. Various methods were tried to control it and finally a biological balance has been attained with fish and plants both thriving.

The walks in the Climatron were first covered with limestone chat but later trap rock was substituted. Eight tons of trap rock were required and more will be added in the future as needed. Tennessee crab orchard flagstone was laid down at the main entrance and also at the north exit and the swale connecting the bog with the pool. In July a water cooler was installed near the portico for the enjoyment of visitors and staff and in that month a dispensing machine for Macadamia nuts was installed with its own nutcracker. The Missouri Highway Department donated two truckloads of granite boulders, which will be used to accept plantings and serve other decorative purposes in the Climatron.

Something new in the way of added attractions was inaugurated in the Climatron and will be continued periodically as occasions arise. During Aloha Week, which consists of festivals held throughout October on the different islands of our 50th State, a "Salute to Hawaii" was staged with great success October 28 and 29. A palm-thatched hut was the featured exhibit on the portico, under which an ornate table decoration of typical Hawaiian flowers and accessories was placed. This arrangement was designed by Gladys Turner, one of the best known floral artists in the city. Ben Hill, manager of Jos. Witek Florist, made several artistic arrangements with Hawaiian motifs and exhibited them near the entrance under the banyan tree. Pan American Airlines installed a booth and distributed folders and the Hawaiian Tourist Bureau supplied colorful posters. A number of real Hawaiian girls dressed in sarongs and muumuus served as guides, strung flower leis, and posed for photographers against the Climatron's jungle settings. Orchids were scattered on regular exhibition tables and also adorned the large reed mat hung on the fountain wall. Hibiscus, the traditional flower emblem of Hawaii, was proliferously displayed in various colors on the many bushes growing in the Hawaiian garden.

During the Christmas holidays an unusual Christmas tree was featured in the Climatron. In keeping with the tropical setting where the traditional spruce or balsam fir would be out of place, an 8-ft. East Indian spurge, *Euphorbia antiquorum*, was decorated with cut orchid flowers in tubes, and strung with tiny flickering electric lights and some Spanish moss.

Work in the other greenhouses was carried on as usual. When the old Citrus House roof became dangerous, the plants were removed from it and the house put out of commission. The cycads were either transferred to tubs and boxes or set in the ground of the Aroid House. Two remaining alcoves were torn down and made available for tubbed specimens. The old Bromeliad House was reconverted into a house for Dendrobiums and Cymbidiums, necessitating the removal of all remaining exotic plants and the building of wooden benches for the orchids. Since it was decided to stop sales of water lilies, less propagation space was needed and one of the houses containing the lily tanks was converted into a storage place for potted cacti.

In anticipation of rebuilding the existing outdoor pools and the abandonment of the project, the pools were not plowed until late in May and only planted the first week of June. The center pool was used as a mirror basin after heavy doses of sodium arsenite were applied to kill the weedy Sagittaria.

Informative and identifying labels are a "must" for any collection of plants. Considerable progress in this endeavor was made in 1961 so that most plants on exhibition, especially in the Climatron, have a label affixed to them. More than a thousand tags were printed by hand and many pot labels punched out or stamped on the machine.

FLORAL DISPLAYS

PAUL A. KOHL, Floriculturist

The first major floral display in 1961 was the Orchid Show, which opened with a preview for the Friends of the Garden on January 19 and continued through February. On January 28 and 29 the Orchid Society of Greater St. Louis staged its own orchid show on the balcony with a number of beautiful exhibits.

Camellias were in full bloom in the Linnean House in February. To step into this greenhouse on a cold, winter day is a revelation. Blooming camellias, separated from the snow by only a door, are a sight to see.

Tulips were shown in a formal garden from March 5 to 19. The display contained 1000 pans of tulips and narcissus, representing twelve varieties of tulips and three of narcissus. The Easter display, which is also the Spring Flower Show, opened Palm Sunday, March 26, and continued until April 30. The Spring Flower Show always attracts many visitors, since it is held at a time of the year when many people are eager to see something fresh and green after a long winter. Visitors are not disappointed when they view a spring show, for there is such a variety of colorful plant material not seen at any other time of the year. The collection of azaleas is the highlight of the show, but the brilliant cinerarias, butterfly-flowers, calceolarias, calendulas, cyclamen, genistas, lilies, marguerites, nasturtiums, primroses, snapdragons, stocks, anemones, freesias, hyacinths and tulips all add their beauty to this most colorful show. A pleasing fragrance coming from such plants as genistas, lilies, nasturtiums, roses, freesias and hyacinths fills the air. The St. Louis Daffodil Society held its fourth annual Daffodil Show on April 15 and 16. The show was staged on the balcony and along the corridor in the Aroid House. May 6 and 7 the African Violet Society held its annual show in the flower house; May 13 and 14 the Missouri and St. Louis Aquarium Societies held their tropical fish show in the flower house; May 20 and 21 the St. Louis Horticultural Society sponsored the spring flower show for its members; and May 27 and 28 The Rose Society of Greater St. Louis staged its rose show. During June the Garden displayed hydrangeas which were gradually replaced with fancy-leaved caladiums and other foliage plants during the summer months. July 8 the second hemerocallis show was held. The Illinois Gladiola Society exhibited gladiolas on July 23 and these were displayed through Wednesday, July 26. September 2 through September 10 the Henry Shaw Cactus Society held its annual show of cacti and succulents; September 16 and 17 were the dates of the Harvest Show of the Regional Council of Men's Garden Clubs of Greater St.

Main window of Boyd's store, Olive Street, with model of Climatron and plants.
PHOTO P. A. K.

Louis. On September 23 and 24 the Greater St. Louis Dahlia Society sponsored the Mid-West Dahlia Show and on September 30 and October 1 the Greater St. Louis Rose Society held its first fall rose show. The Veiled Prophet Queen's bouquet was displayed on the balcony October 4. The Budgerigar Society of Missouri, Inc., used the Floral Display House for judging its birds on October 7 and 8.

The Chrysanthemum Show, one of the largest and most popular shows of the year, opened November 9 with a preview for the Friends of the Garden and continued until December 3. An additional feature of this show was tape recordings of Oriental music in keeping with the Japanese motif of the show. During December there was a display of pink, red and white poinsettias with accents of ardisias, ornamental peppers and white and yellow chrysanthemums.

Miscellaneous Exhibits—During the first week of April, Boyd's downtown store featured the attractions of Shaw's Garden in its show windows. Displays contained replicas of the entrance gate and various other architectural features of the Garden. Also displayed were pictures of Henry Shaw, his town and country residences, the entrance gate, the Climatron, flower shows and nature study classes. The corner window at 6th and Olive streets contained a model of the Climatron. Boyd's installed a booth on the main sales floor where Friends of the Garden sold half-price admission tickets to the Climatron, with Boyd's underwriting the other half of the ticket cost. The Garden supplied 215 flowering and foliage plants for this display.

The Annual Flower Sermon, provided for in Henry Shaw's will, was scheduled for April 16 and for Flower Sunday at Christ Church Cathedral the Garden supplied two hundred plants, including azaleas, cinerarias, lilies, marguerites, Martha Washington geraniums, roses, schizanthus and snapdragons.

The Women's Association of Shaw's Garden and Famous-Barr sponsored "Through the Garden Gate" on the Famous-Barr Clayton parking lot for three days, May 12 through 14, for the benefit of the Garden. Members of the Association helped to grow some 20,000 plants in the Garden's greenhouses, staffed the booths during the sale, and transported many of the plants in station wagons.

From August 11 through the 20th Mrs. H. M. Stolar exhibited her paintings of scenes of the Garden on the balcony of the floral display house.

October 14 a concert was to be given on the knolls by the Rosen String Quartet, a chamber group of St. Louis Symphony musicians, but because of the cool weather the concert was given in the Flower House. About 300 people attended.

Palms, chrysanthemums and orchids were used to decorate the stage of the Art Museum auditorium on December 5 for the occasion of the St. Louis Award, which was presented by Robert Brookings Smith.

* * *

ORCHID COLLECTION

R. J. GILLESPIE, ORCHIDOLOGIST

THE most important activity of the Orchid Department in 1961 was the complete recataloguing of all the species orchids in the collection and the assembly and distribution of an orchid species exchange list The Garden now has available for exchange with horticultural and botanical institutions 1800 species and varieties of orchids with an almost equal number of hybrid plants.

Cultural Improvements—The major cultural improvement made during the year was the application of polyethylene film over the entire warm greenhouse. This film layer resulted in the maintenance of optimum temperatures in this area even during sub-zero conditions outside. The Garden's valuable collection of Stanhopea orchids and allies (now the world's largest and most comprehensive) are housed in this greenhouse, along with other valuable warm-growing plants. Polyethylene film was also applied to the north gables of all the remaining orchid houses. The film layer has prevented these greenhouses from developing cold pockets in the north ends during cold winter nights.

Artificial Orchid Trees—The fabrication and planting of orchid display trees for the Climatron was continued during the year. Seven new trees containing plants from such areas as western Mexico, Costa Rica, Peru and Indonesia were placed in the Climatron in the climatic area best suited for each tree. An interestnig addition to the orchid display in the Climatron was the erection of a special display of miniature orchids using a new display table containing a row of illuminated adjustable magnifying lenses, under which the unusual coloring and the intricate floral details of the miniature orchid flowers can be seen in enlarged form.

Orchid Show—The annual orchid show was held during the last week of January and during the entire month of February. The display consisted of two circular gardens in which numerous hybrid Cattleyas, Dendrobiums, Cymbidiums and Cypripediums were staged with excellent effect. Numerous botanical orchids from the Garden's collection were also exhibited. During the first week of the show, the Orchid Society of Greater St. Louis held its first orchid show on the balcony of the Floral Display House. This show contained numerous orchid displays from various parts of the country and attracted an unusually large number of visitors.

Displays—Two large displays of orchids, one of hybrid Cattleyas and the other of botanical orchids were maintained throughout the year in the Climatron. Orchid plants were also supplied weekly for the Shaw House and, as usual, cut flowers were donated by the Garden for the Veiled Prophet Queen's bouquet in October.

Accessions—Several hundred new orchid species were added to the collection during the year. The most noteworthy species accessions were two collections of orchids received from Peru, among which was found *Oncidium* *sanderae*, a species formerly believed to be extinct. A large collection of species, mostly of the Cattleya group, was received from the Instituto de Genetica in São Paulo, Brazil. These plants represent living type specimens as closely as possible and as such are valuable horticultural and botanical material. The Montreal Botanical Garden donated an unusually varied collection of orchid species. Another valuable collection of plants was received from Mr. Hermon Slade of Homebush, Australia, and Longwood Gardens of Kennett Square, Pennsylvania, also donated a small group of plants to the Garden, among which were several rare species and several horticulturally interesting varieties. A very rare plant from the Fiji Islands, *Dendrobium prasinum*, was received from Stuart Low Co., Sussex, England. Noteworthy hybrid orchids were acquired from Vacherot Lecoufle, Paris, France; Stuart Low, Sussex, England; Sierra Madre Research Institute, Sierra Madre, California; Dr. Nagano, Tokyo, Japan; and H. Wickmann, Celle, Germany.

Orchid Judging—In October, monthly regional orchid judging under the sponsorship of the American Orchid Society was started at the Garden. This activity uses the facilities of the Garden and employs the American Orchid Society judges on the Garden's staff, offering orchid growers located in the Midwest an opportunity to have their plants and flowers evaluated and awarded prizes.

Instruction—The Orchid Department offered a course in orchid culture in April and it was well attended and received. Orchid Department staff members gave numerous lectures locally and contributed articles to several publications. They also participated in orchid programs and orchid shows at Chicago, Nashville, and Detroit.

GROUNDS AND MAINTENANCE OPERATIONS

LOUIS G. BRENNER, Grounds Superintendent

In addition to normal maintenance, the Grounds Crew was actively rehabilitating and developing the grounds during the past year. Much of the early spring was devoted to the reconditioning of the picturesque knolls area where principal work was centered in the Long Knoll. Many aged shrubs were removed to make room for younger and more interesting varieties selected with the advice of the Garden Committee of the Board of Trustees. Through the generosity of Forrest Keeling Nursery, fine full sized shrubs were made available to the Garden and later proved an effective background for the colorful plantings of cushion mums and dahlias. The blaze of late summer and autumn color in the Knolls was largely the result of many affectionate and sweaty hours volunteered by the St. Louis Council of Men's Garden Clubs, whose members planted, grew and tended the hundreds of mums and dahlias.

A large planting of zoysia grass was made south of the Climatron with sod contributed by the Link Nursery and also by Mr. Ralph Sehrt, Superintendent of Westwood Country Club. It is hoped that this sodded zoyzia grass will be the nucleus of plantings to be developed later in other parts of the Garden.

The narrow band of marsh meandering through the knolls area presents a unique and interesting habitat much neglected in past years. It is gradually being brought back to a colorful collection of plants which in time will prove a popular feature of the Knolls, especially for those who delight in the informality and fascination of marsh plants and the attraction such a habitat has for birds of many species. First of a major introduction of plants for rehabilitation of the marsh has been the contribution of a fine collection of unnamed *Iris Kaempferi* Japanese iris hybrids raised by Mr. Edgar Denison of Kirkwood.

The Rose Garden continued to attract many visitors from late May till killing frost. The display of new rose varieties provided here by the country's major rose growers is an outstanding feature of the grounds in summer and rose fanciers find annual fascination in the preview of new varieties a full season before they become available on the market. The devoted efforts of a dozen or more Friends of the Garden in keeping faded blooms clipped was most helpful in maintaining a fine show of roses throughout the season.

The Grounds Crew joins with the Engineering Department in the complex function of providing a multitude of services to all departments in addition to maintaining outdoor plantings. Primary services assigned to the Grounds Department are carpentry, painting, glazing, masonry, moving of properties, trash collection and disposal, and janitorial custody of buildings.

In early spring a stone planting box was constructed on the deck above the blower room in the Climatron, with the twofold purpose of restraining visitors from the edge of the deck and providing planting area to screen a rather ugly bare concrete wall. Today a lush screen of husky philodendrons and tree ferns covers planting box and wall alike, leaving the bruised fingers and skinned knuckles that built the wall almost a pleasant memory.

Summer found the carpenter and glazer busy in the blazing sun renovating roofs and ventilators of the growing greenhouses, a task that busied them and two helpers until the last chill days of October. Reduction of heat loss and a resulting improved growing climate within the houses during the past winter months proved the hours and materials well spent.

In late fall also the Grounds Crew aided in moving several large plants into the Climatron from other greenhouses. The large ball of soil which had to be moved with these plants made moving difficult, especially in the Climatron, where machinery could not be used.

Of Tar and Feathers—Volunteer workers at the Garden and staff members all have enjoyed the luxury of the recently paved service road, whose bump-free surface makes possible driving speeds which are higher than necessary or safe for the wildlife which uses the Garden as a quiet sanctuary. Already three quail have been found by the roadside as mangled bits of bone and feather. Are the few seconds saved by speeding along this short road worth as much? Cannot we who are responsible for creating and developing a sanctuary for meditation and relaxation amidst floral beauty permit ourselves the luxury of taking a few seconds longer in our comings and goings? Conspicuous rutting and wear of the road edge would also seem to dictate prudent and considerate driving when using this road.

ENGINEERING OPERATIONS

KENNETH A. SMITH, Engineer

The usual operation and maintenance of the heating plant and the water, steam, and electric services of the Garden have been carried on under the direction of the Engineer and his assistant, James Hampton.

Special work in addition to normal maintenance was again centered about the Climatron, which is still in the process of refinement and development after more than a year of operation. Several additions were made to Climatron equipment to make possible easier operation. More water lines were installed on the lower level this year, and an air compressor was placed in the machinery room with piping to supply air to the experimental area. Loudspeakers, brackets, and wiring were installed to make possible the recorded Climatron concerts which entertain visitors daily.

The addition of a filtering system to the Climatron pool greatly reduced the amount of algae there and made it possible for visitors to the underwater tunnel to see through the plexiglas wall. Controls, piping, and a pump were also included in the system.

Another area of work during the year was the Floral Display House, where a new electric line and panel were installed. The rewiring made possible the Canteen vending machines and new overhead lights and spotlights.

The heating plant required new refractory floors in No. 2 and No. 3 boilers.

Other duties of the Engineering Department included maintenance of grounds equipment and small jobs for other departments.

ARBORETUM

FRANK L. STEINBERG, Superintendent

The Arboretum at Gray Summit is open to the public every day and cars may drive around the Pinetum Lake throughout the year. The longer drive past the dogwoods, redbuds, and naturalized daffodils to the trailhouse and wildflower trails was kept open for six weeks in April and early May.

Mowing required 780 tractor hours for the Arboretum and an additional 64 hours for the 120 acres of farm property. Mowing was begun on the first of June and was finished by the first of November. The Pinetum was mowed in June and in October; roads were graded as necessary. Dead trees were removed and pruning done as time permitted.

Maintenance of facilities at the Arboretum included repair to the Brenner house and garage as well as cleaning and painting of both The Frizzell residence was repaired, cleaned, and given two coats of paint. The interior was repaired and redecorated. A new well was dug and a heating plant installed for the brick house and the greenhouses were rehabilitated.

FRIENDS OF THE GARDEN NOTES

NEW Friends officers were installed on March 1 with Harry E. Wuertenbaecher, Jr., as president; Sears Lehmann, treasurer; and the following vice-presidents: Mrs. William R. Bascom, Mrs. Curtis Ford, Mrs. M. M. Jenks, Mrs. Fristoe Mullins, and Mrs. Eli M. Strassner. The Garden is fortunate to have such leadership for the Friends and is especially grateful to Mrs. Bascom for her willingness to continue in an active role as vice-president upon her retirement from the presidency. With her guidance, the Friends have come a long way in the past two years, and she may justly feel that she turns over to the new president the reins of a thriving and healthy organization. Happily, Mrs. Kathleen M. Miller as Executive Secretary will also continue to make her vital contribution to the Friends.

When asked for a comment on the year ahead for the Friends, Mr. Wuertenbaecher had this to say:

"I believe that this year has the possibility of being the most challenging and the most rewarding twelve months that we as Friends of the Garden have ever experienced. As you know, the Board of Trustees is at present reviewing plans for the next major development at the Garden and those of us who have had an opportunity of a 'sneak preview' feel that this will be as important a step to rebirth of the Garden as the Climatron.

"However, as is always the case with such fascinating endeavors, money is essential. As Friends we are called upon as never before to help provide some of the much needed annual maintenance money to keep the Garden running so that we can move forward and complete this next step of the Garden's development. We must all redouble our efforts during the next few months to obtain as many additional Friends of the Garden as possible. In addition to obtaining new members, it is equally important for us to renew our own memberships and when doing so give some thought to increasing the amount that we personally invest in the Garden's future.

"We can thus play a crucial part in the development of our community's most unique cultural institution."

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On March 9 the last trace of the fragrance of exotic spices lingered and faded from the Floral Display House, and that remarkably versatile structure (ballroom, restaurant, lecture hall, and concert hall have all been among its unusual uses) returned to its normal function of providing a setting for flower shows. The experimental Indonesian dinners were, by any measure, a solid success. Both as to public response and practical feasibility, we can now say that deliciously different food in an attractive, exotic atmosphere is A Good Thing. It will be some time yet before a real restaurant can be opened at the Garden, but plans are afoot now to offer some of Mr. Falkenberg's Indonesian delicacies at a modest "Javaburger" stand this summer.

* * *

Another Friends "trial balloon," Mrs. Dan Sakahara's course in classical Japanese flower arranging, also attracted impressive public response and continued interest. Those who took the six-session course this spring were impressed with the complexity of classical flower arranging and many want to go on to learn more. As soon as Mrs. Sakahara's other commitments permit, it is hoped that she will be back with another course. Watch the BULLETIN for information.

* * *

The remaining free First Monday Lectures are listed below, for the benefit of those who have mislaid the announcement which was mailed out earlier:

May 7: Dr. Robert L. Dressler—"MBG Expeditions to Northeastern Mexico." A veteran collector of wild orchids, Dr. Dressler will report on his latest expeditions.

June 4: Paul A. Kohl—"A Garden's Spring Parade." The Garden's chief Floriculturist will give a colorful presentation of choice plants in St. Louis.

NEW MEMBERS OF THE FRIENDS OF THE GARDEN
JANUARY 1, 1962 THROUGH MARCH 21, 1962

Dr. Otto Bachman
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Miss Rosemary Bellers
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Miss Emily P. Eaton
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Mr. and Mrs. Carl H. Klug
Mr. and Mrs. Arthur E. [illegible]
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St. Louis Nature Study Society
Sappington Acres Garden Club
Mr. and Mrs. Darwin W. Schlag, Jr.
Mr. and Mrs. Wilson Schroeder
Seeders and Weeders Garden Club
Mr. and Mrs. T. M. Sparks
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Edgar Anderson, Curator of Useful Plants

Henry N. Andrews, Paleobotanist

Clarence Barbre, Instructor

Louis G. Brenner, Grounds Superintendent

Ladislaus Cutak, Greenhouse Superintendent

Carroll W. Dodge, Mycologist

Calaway H. Dodson, Taxonomist and Curator of Living Plants

Robert L. Dressler, Taxonomist and Editor of the Annals

James A. Duke, Assistant Curator of the Herbarium

John D. Dwyer, Research Associate

Waldo G. Fechner, Business Manager

Raymond Freeborg, Research Associate

Robert J. Gillespie, In Charge of Orchids

Brian Gordon, Editorial Assistant

James Hampton, Assistant Engineer

Paul A. Kohl, Floriculturist

C. Ranlet Lincoln, Assistant to the Director

Viktor Muehlenbachs, Research Associate

Norton H. Nickerson, Morphologist

Lillian Overland, Research Assistant

Kenneth O. Peck, Instructor

George H. Pring, Superintendent

Owen J. Sexton, Research Ecologist

Kenneth A. Smith, Chief Engineer

Frank Steinberg, Superintendent of The Arboretum, Gray Summit

George B. Van Schaack, Librarian and Curator of Grasses

Trifon von Schrenk, Associate Curator of the Museum

Robert E. Woodson, Jr., Curator of the Herbarium

SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 10:00 P. M. Tower Grove House is open daily from 9:00 A.M. to 5:00 P.M. (April through November); 10:00 A.M. to 4:00 P.M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

April 1962
Volume L
Number 4

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COVER: Henry Falkenberg, Manager of "Rumahsahtay," the Garden's just-opened "Javaburger" stand featuring authentic Indonesian and Oriental food, adds a decorative touch of bamboo to the side of the building. A thatched roof will eventually complete the structure.

PHOTO BY BRIAN GORDON

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CONTENTS

Herb Magic

Through the Garden Gate

Book Review

Tower Grove House Hostess Training Program

Friends of the Garden Notes

* * *

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Guest Editor for this issue: RANLET LINCOLN.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Volume L No. 4 April 1962

HERB MAGIC

MARY A. GAMBLE

Herbs are like salted peanuts; take one and you can't stop. They are a fascinating subject with so many facets of interest that almost everyone finds a side which appeals. There is the history of herbs, and the story of their culture and uses; and always, the continuing search for the perfect answer to that intriguing question, "What is an herb?"

What is an herb? Webster says an herb is "a flowering plant whose stem above ground does not become woody and persistent" . . . along around 800 A.D. the Emperor Charlemagne answered the question with this royal reply: "The friend of physicians and the praise of cooks." The American Herb Society defines an herb as "any plant that may be used for pleasure, fragrance or physic" . . . and the St. Louis Herb Society supports the view that an herb is "a plant with a use."

Broadly speaking, just as a weed is "a plant out of place," so is an herb "a plant with a use." A rose in a cornfield is a weed; a dandelion in a pot of greens is an herb.

Herbs are ancient plants, and the garden plants we enjoy so greatly today are for the most part their descendants. Some have changed greatly, others almost not at all. Some have remained important; others have faded from sight. Those which have flourished—the great herbs—have done so because they combine utility and beauty and can therefore both serve and delight man.

Interest in herbs has varied; at the moment it is high. Today they seem to be everywhere. The TV food commercials are spiced with herbs; the women's magazines feature articles about them; they're on the food pages and in the grocery ads My own interest in herbs is only about a dozen years old, but even in that comparatively brief span of time I've learned there is no more engrossing subject, nor one more rewarding to the gardener, the cook, the housewife, or the ordinary curious person

Herbs open new doors of interest: doors to a new awareness of fragrance, a new appreciation of flavor, a new dimension in gardening And, as you dip into their story—older than recorded history—you develop a new feeling of kinship with all those who have used or treasured herbs down the ages. And you find there is a rapport—which often warms to friendship—with those who share with you the day-to-day pleasure of discovering herbs' versatility and charm. Their uses to mankind have been—and remain—innumerable and immeasurable. Their appeal, through their fragrance, their flavor, their quiet, usually unassuming beauty, is almost unlimited and universal.

Remember the phrase "Open, Sesame!"? The magic password to the robbers' cave in the Arabian Nights' "Tale of the Forty Thieves"? When I was a child, "Open, Sesame!" was the key to a magic hour of reading or play. Now I know that sesame is an herb which grew in the Nile Valley long before Moses was discovered floating in the bulrushes. It is a tall, lovely annual whose seeds ripen and literally pop from their pods. Thus the ancient Arabian who spun the original tale turned to a simple fact of everyday life to coin his immortal phrase. Today, it's fun to think that sesame—and scores of other herbs—can open the door to a mature enjoyment of new areas of flavor, beauty and use which can be discovered in the wonderful world of herbs.

If history interests you, let herbs be your guide—they've made history. Since time immemorial men have traded in spices; the search for them led Marco Polo to China, Christopher Columbus to America, and Magellan around the world. Much of the mystery of the "mysterious East" stemmed from the Arabs' desire to keep secret the sources of the spices they supplied to the pre-Christian world. In succeeding centuries the Greeks and Romans developed greater knowledge of herbs and spices and extended their use. The Romans carried herbs with them on their paths of conquest; and wherever colonists traveled, herbs went with them. Wars were fought over spice-rich lands, and the nations that controlled the spice routes dominated the world.

There have been eras of special import in the development of herbs. One of the great early landmarks was the work of Dioscorides, the first-century Greek physician who was first to establish botany as an applied science. This Greek—who served in Nero's army and was, according to legend, physician to Antony and Cleopatra—catalogued some 600 plants, describing their medicinal qualities and writing down the virtues which previously had been passed by word of mouth from individual to individual—a risky way to give a prescription! This was the first organized effort to compile herbal knowledge and it served as the authority in its field throughout the Middle Ages and into the Renaissance.

The Romans, as already noted, were responsible for spreading herbs across Europe and the British Isles. The Middle Ages, which followed upon the fall of the Roman Empire, brought knighthood and herbs to fullest flower. And the great adventure of the times, the Crusades, resulted in the addition of new herbs to European gardens as the knights, returning from the Holy Land, brought such treasures as tarragon and sesame seed to their ladies.

The great explorations which marked the close of medieval times developed a two-way traffic in herbs; Columbus' men planted borage on Isabella Island and later Spaniards carried ginger to Jamaica—which still produces some of the world's finest—and chilies from tropical America to Spain.

The invention of printing in the 15th century made possible wider distribution of herbals, which up until then had been hand-lettered and beautifully illuminated by monks. In 1500 a rich German underwrote the writing and illustrating of the "Garden of

Health." In his introduction he wrote: "Since man can have no greater nor nobler treasurer on earth than bodily health, I came to the conclusion that I could not perform any more honorable, useful or holy work . . . than to compile a book in which should be contained the virtues and nature of many *herbs* . . . together with their true color and form, for the help of all the world and common good." Thus was spread the knowledge of herbs.

The American colonists brought herbs to the New World, and those who returned to England took with them herbal lore of the American Indians. Tobacco was a narcotic and was used in surgery before it was smoked in England. Witch Hazel was another American contribution.

If cooking is your forte, then herbs are among your best allies. Irma Goodrich Mazza, a noted writer on herbs, has this to say: "Just six herbs—mint, thyme, sage, marjoram, rosemary, basil—will make you a good cook, while 25 herbs will bring you culinary fame."

If you love to dig in the dirt, nothing will produce a greener thumb—with less effort and comparatively fewer disappointments—than a garden of herbs. If you're an individualist, if you practice simplicity, if you enjoy sharing your discoveries and fun; then herbs are your dish.

Learning about herbs is a slow process. You have to try everything yourself. Herb gardeners and herb cooks may start with another's ideas, but almost immediately they begin to change them, to evolve their own variations. It's this experimentation which makes herbs fun and removes the monotony so often associated with jobs which must be done over and over again.

Herbs add a new dimension to cooking. If "flavor is the soul of cooking," as an old saying goes, then herbs are the soul of flavor. There are rules to herb culture and cooking, but many of them seem to be made only to be broken. It takes daring, imagination, and originality to cook with herbs—plus restraint. Sometimes I think that the only dish better than one seasoned with herbs is one which has no herbs at all!

Herbs are the most fun if you can raise at least a part of those you use. So—how does one start an herb garden? How much space is needed? How many herbs should be included? What are the cultural requirements? The best gardener I know says: "You can't tell people exactly how to raise specific herbs; each gardener has to find out for herself what works for her."

But you can say this: (1) herbs need full sun (with some few exceptions); (2) herbs are singularly unparticular about soils; they do best in average to poor soil; soils too rich results in more foliage and less flavor. Some herbs require sweet soils, others accept acid; (3) most herbs require good drainage, but the amount of moisture needed in the soil varies; (4) most herbs are resistant to disease and plant pests; (5) most of them require little care and are easy to grow.

You know, of course, that herbs are annuals, biannuals or perennials—the latter to be considered in two categories: the tender perennials, which must winter indoors in climates such as ours, and the hardy perennials which can remain outdoors the year round. Some herbs can be grown easily from seeds; others must be propagated from cuttings or layering.

You may not know that most savory herbs belong to four botanical families: the mint, parsley, aster, or lily family. Most belong to the first two. They are classified by characteristics which are common to all plants of the family. For example, the herbs which belong to the parsley family have flowers formed in circular heads, or umbels, at the top of hollow stems; the leaves are alternate and finely divided and the fruit forms in two parts. Seeds, leaves and stems all contain an aromatic oil. Some other members of the parsley family are anise, celery, chervil, dill, and fennel.

Your garden may be formal, in the manner of the Tudor period, or simple, like the cottage gardens. But my advice is to keep it simple. The greatest pleasure with herbs comes if the hands that till the soil, pull the weeds, and harvest the crops are your own. Common sense suggests shying away from the elaborate designs which were the delights of herb gardeners of olden days. Scores of books, articles—and any herb gardener—will supply information as to height of plants, normal growing habits, and so on.

A government bulletin suggests the following herbs for the beginning herb garden:

Pungent herbs: rosemary, sage, winter savory.

Herbs strong enough for accent: sweet basil, dill, mint (the peppermint and spearmint flavors), sweet marjoram, French tarragon, English or French thyme.

Herbs especially good in blends: chervil, chives, parsley, summer savory.

Actually, the role of the herb is to enhance the flavor of a dish; the herb should never dominate. Some herbs—such as marjoram—seem to give a lift to natural flavor; or, when used in combination with other herbs, to serve as a catalyst, blending all flavors into one, so that the flavor of the whole surpasses that of the parts. It is the whole dish with which the cook is concerned, not the flavor of any individual item used in it. In fact, if you can taste the herb, you've used too much. The flavor of a successful dish should intrigue, tantalize, tempt—and satisfy.

It is in the subtle, skillful use of herbs that individuality again comes in. If you don't have one already, soon you'll have discovered a favorite herb; then two and three and four and five and six. And as you master the secrets of each, you'll expand your repertoire until your cooking is filled with imagination and excitement—and that wonderful sense of satisfaction which comes from discharging a simple task creatively.

Just remember: never pair two prima donna herbs; never risk overusing an herb—it's much better to use too little; let the herb enhance the basic ingredient of the dish.

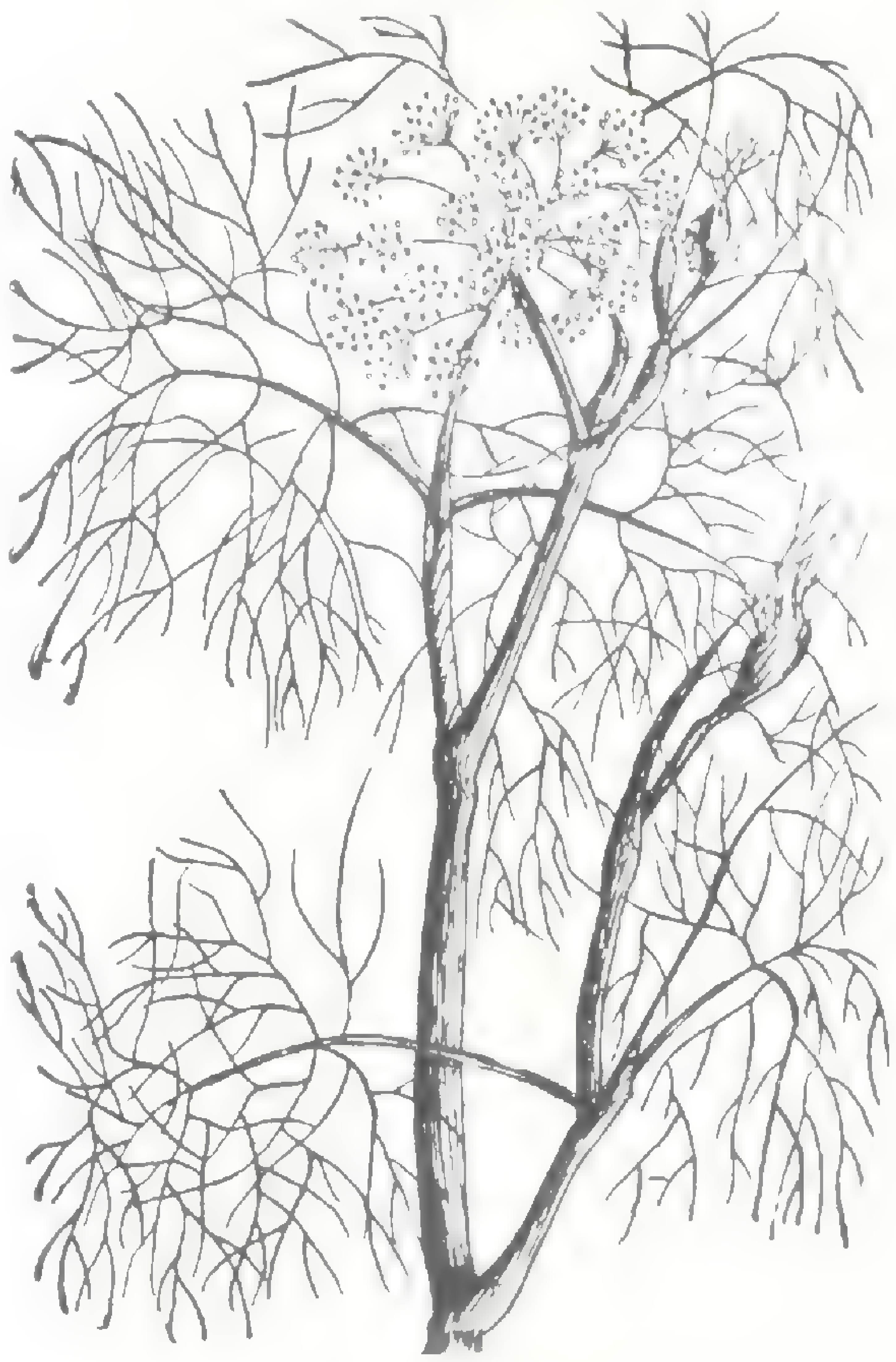
What are the most used herbs? Before that question can be answered, we must ask another. What category of herbs have you in mind: pot herbs, nose herbs, salad herbs, healing herbs, or herb repellents? Pot herbs, of course, are exactly what their name implies—those which go in the pot; nose herbs are the aromatic herbs, used in olden times as strewing herbs, incense and linen sweeteners. Healing herbs are those whose qualities are strongly medicinal. These include many of the "simples," as the individual herbs were called. The word "simple," as used in old herbals, denoted an individual herb with a single medicinal quality. Often numerous "simples" were used together, or "compounded." The latter word remains familiar to us, but the word "simple" has almost disappeared from herbal use. And of course, many of the herbs are good for almost everything.

So, let's consider the pot or savory herbs. No herb grower would agree with another on any complete list, but I believe all would include the sextet the French call "les fines herbes": basil, chervil, marjoram, thyme, rosemary, and tarragon. I think most would add dill, the savories, sage, the alliums (garlic, onions, shallots, chives), parsley, mints, fennel, burnet and oregano. There are many others, but since I can't possibly discuss them all—or even all those named, let's make an arbitrary selection: dill, chervil, burnet, oregano, marjoram, thyme, the savories, tarragon, rosemary, basil.

Dill, a hardy annual, belongs to the parsley family. It is a tall, pale green plant with plume-like leaves and a broad, circular cluster of bloom which looks like a delicate yellow version of Queen Anne's lace. These are the fruiting umbels which mature into the brown seeds which, ripened, are used as a condiment. Dill is easy to culture and once you've had a successful planting, it will sow itself in your garden to the point of nuisance. However, it is a wonderful herb to use—all of the plant is used in cooking; its feathery foliage is delightful in flower arrangement and, dried, it is a perfect addition to an herb wreath to hang as a holiday decoration on your kitchen wall.

Dill is native to Mediterranean areas and southern Russia, as well as parts of Africa and Asia. Its name is derived from a Saxon word meaning to lull, and it has an ancient reputation as a soothing medicine. In the Middle Ages dill was used by magicians in casting spells against witchcraft; it "hindered witches of their will." The ancient Greeks and Romans crowned their heroes with garlands of dill and their poets sang its praises. It is believed by some authorities that the anise mentioned in the Bible as a tithe of the Pharisees was actually Greek dill. Dill was one of the "meeting seeds" chewed

Dill (*Anethum graveolens*)



Dill

by early American colonists during interminable sermons.

Dill is a medium-strength herb; the aroma and taste of the flowers and leaves are fresh and sharp, with a suggestion of sourness. Dill is used to season pickles and it's wonderful in salads and with cottage cheese. It has an affinity for lamb and is good with fish. Sprinkle dill on rye bread or add to bread dough; add it to cole slaw and to the water in which you're cooking beans, cauliflower, cabbage. Dill butter makes a wonderful spread for rye or brown bread. And you haven't enjoyed new potatoes until you've sprinkled them with chopped fresh dill. Unfortunately, many dill recipes call for *fresh* dill and cooks more expert than I say that seed cannot be substituted.

Dill can be planted in the early spring and then thinned to 3 or 4 plants per foot. Only light cultivation is needed. The seeds germinate in ten days to two weeks and the plants grow rapidly; if you space your plantings properly, you can have several harvests each season. Dill does not transplant as readily as many herbs.

Chervil, also known as Sweet Cicely, is another member of the parsley family and is another herb which is best used fresh, since most of the flavor resembles that of tarragon. The seeds should be planted in the early spring in a partially shaded spot; it likes a moist location. An Herb Society member says she tosses chervil seed on the mulch pile and it thrives there.

The ancient Greeks and Romans cooked the foliage of chervil in the same way we cook spinach, and they ate its roots. Charlemagne had chervil in his garden and the Saxons favored it as a pot herb. In Elizabethan times the seeds of chervil were used to polish furniture and floors.

Chervil is perfect in salads, cheese dishes, sauces, egg dishes or with fruits. Chervil and tarragon used together create a flavor typically French. Chervil has the same quality of marjoram, in that it enhances the flavor of other herbs when used in a blend. Its botanical name has the touch of poetry which is associated with many herbs; it means "a leaf which rejoices the heart." Chervil, because of its deep root structure, is difficult to transplant, but with care, it can be done.

Salad burnet is a perennial which belongs to the rose family. It is one of the species brought to our country by 17th century colonists. It grows from 1 to 2 feet tall and has a luxuriant, feathery, picot-edged foliage. Its neat habits make it a beautiful border plant, while its lush growth and almost evergreen quality make it a fine pasturage where it is cultivated in England, parts of Europe and in our own southern states. It is one of the herbs which has "escaped" to grow wild in dry pastures and along the wayside. Essentially a salad herb, its distinctive cucumber-like flavor adds a gourmet touch to tossed salads. An old couplet says: "salad is neither good nor fair if burnet is not there." In the Middle Ages burnet leaves were used to flavor wine drinks. Its coagulant powers have been recognized for thousands of years.

Burnet plants germinate from seeds sown early in the spring; it prefers poor, dry, sandy soil and a sunny location. The plant can be cut back, beginning when it is about 5 inches high. Use the leaves to flavor salads, to garnish meat and canapes; and by all means make burnet vinegar. It is superb. Burnet is another herb which does not dry well, since the flavor evaporates.

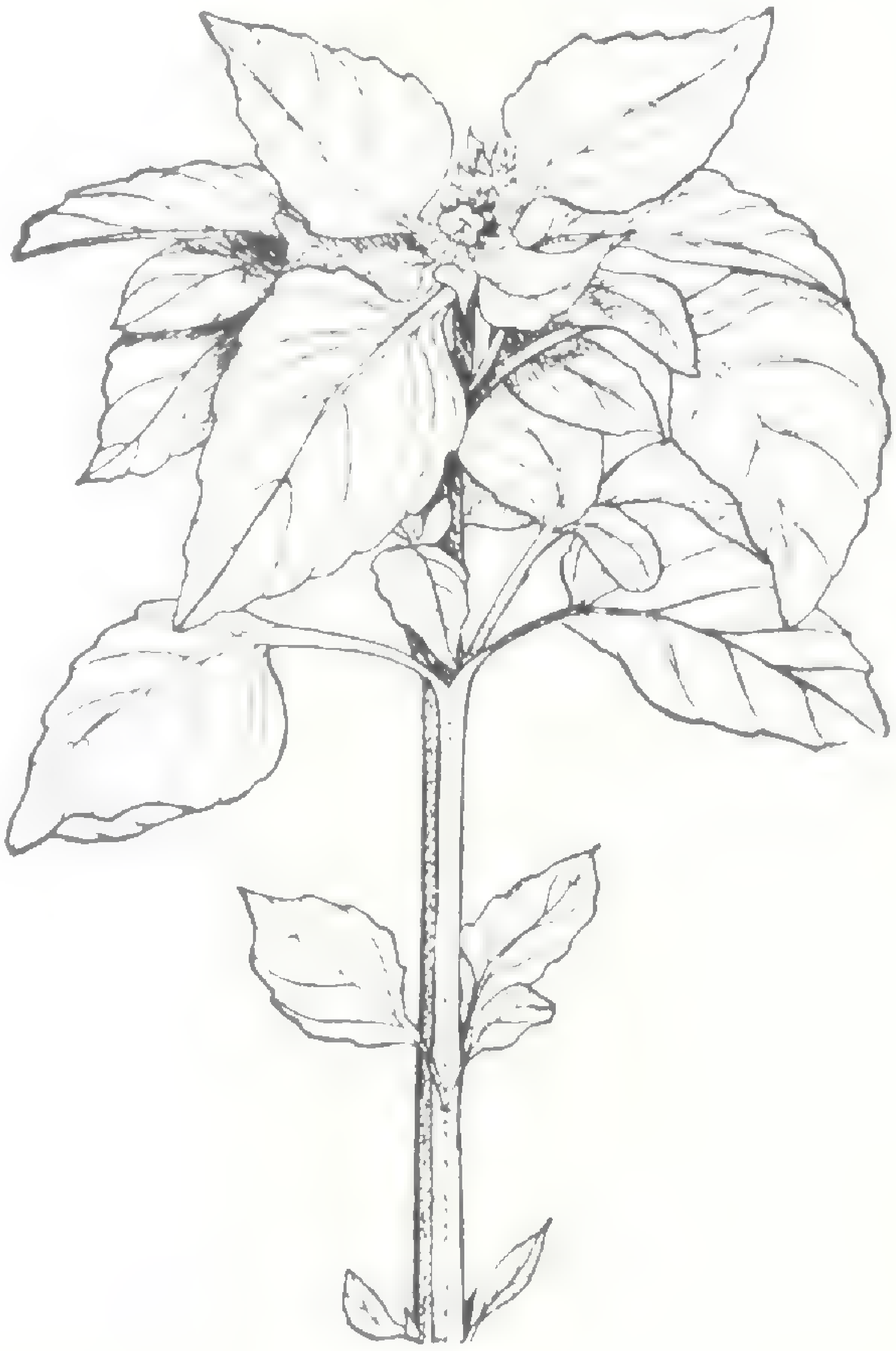
Francis Bacon, the great Elizabethan essayist, wrote in his famous "Essays on Gardens": "Those [herbes] which perfume the air most delightfully, not passed by as the rest, but, being trodden upon and crushed, are these: . . . burnet, wild thyme and watermints. Therefore, you are to set whole alleys of them to have the pleasure when you walk or tread."

Basil belongs to the mint family. The Greeks called it the King of Herbs and the French also knew it as a royal herb. Basil grew first in the hot, sunny climate of the Near East and, like so many herbs, was carried from there to Greece, Italy, Spain, and on throughout Europe and the British Isles. It reached our New World in the 1600's. It is a hardy annual, easy to raise from seed, which should not be planted until the earth feels warm to the hand. (I plant my basil on May 5). It germinates quickly, transplants easily, grows rapidly and self-sows frequently. It comes in many varieties, ranging from a dwarf plant to a lush specimen reaching two feet or more. It bears a small white flower which is not much to look at, but is adored by bees.

Basil, like most herbs, is harvested as it is coming into bloom, when the volatile flavoring oils—contained in small glands in leaves and seeds—are at their peak. Harvesting is best done in the early morning before the sun is high. I harvest my crop by snipping or pinching off the leafy ends (there are herbalists who say it brings bad luck to cut the herb) again and again. And after frost has come and shriveled the remaining leaves and the main plant stalks stand brown and bare, I have one more treat coming. That's when I pull the dead plants and the fragrance which lingers in the woody stems fills the air and rubs off on my hands, and all I have to do to picture the garden in bloom is to close my eyes and sniff. It's this lingering fragrance—steeped in memories of the summer—which makes herbs so enchanting.

Basil has more than its share of the mystery and lore which surrounds all herbs. In Italy it is a symbol of love; a sprig worn behind a maiden's ear invites a kiss, just as a young American girl does when she stands under a sprig of mistletoe at Christmas.

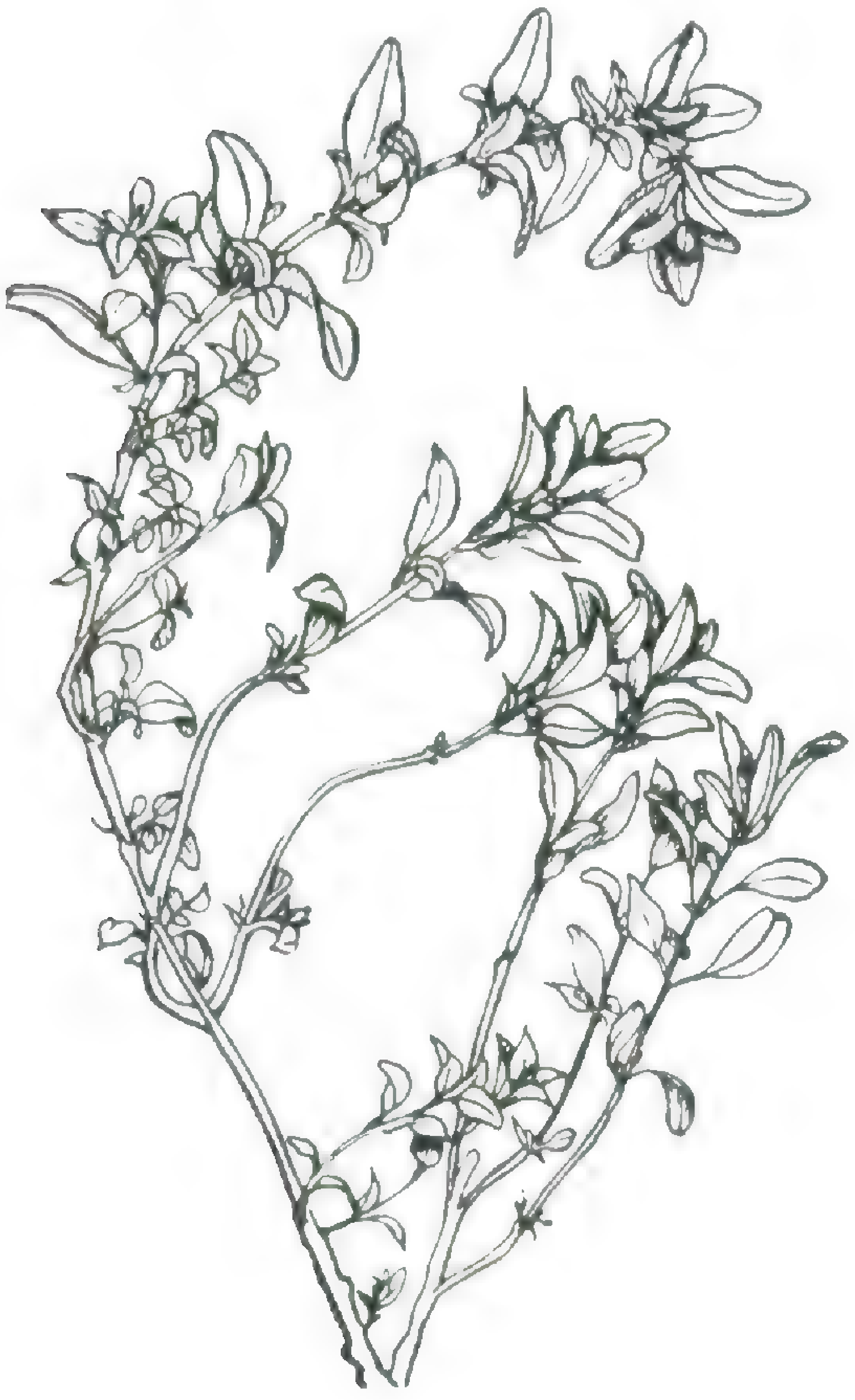
Basil *(Ocimum basilicum)*



In one of Boccaccio's tales, a widow's tears nourished a basil plant which grew in a pot that also enclosed her late husbands head. The Latin author Pliny wrote that basil should be planted with curses; there was an old Italian belief that to place a plant in the shoe of one's enemy would turn that enmity to love. In India basil is known as *tulsi* and is sacred to the Hindu gods Vishnu and Krishna. A medieval manuscript suggests that basil was the Metrecal of the era: "To make a woman shall not eat of anything that is set on the table, take a little green basil and when the dishes are brought to the table, put it underneath them that the woman perceive it not, for men say she will eat none of that which is on the dish whereunder the basil lieth."

Basil is a supremely useful herb. It is wonderful with tomatoes and is sometimes called "the tomato herb." It is as good with meats as it is with vegetables; try it with hamburger, potatoes, eggs, cheese, soups. It makes a good herb butter and an excellent herb vinegar. It's essential in Italian cooking. But perhaps its greatest virtue is its reliability. If you're just starting to try your hand with herbs, begin with basil. Its almost fool-proof culture virtually guarantees success—which is a heady tonic when one is learning an art such as that of growing, using and appreciating herbs.

Marjoram (*Majorana hortensis*)



Oregano also belongs to the mint family. It looks, tastes and smells a good deal like marjoram—sometimes no one seems able to tell them apart. It is a perennial, hardy in many local gardens. It is easy to start from cuttings and makes a lush, soft, dark green plant which is relatively low-growing. It has a bland but pervasive flavor which means it must be used with discretion. It is a flavoring ingredient in Spanish, Italian and Mexican cooking, and is a "must" in pizza. Oregano is widely used in spaghetti and macaroni, with shellfish, eggs, tomato juice or soup. Many cooks find it as useful as marjoram and basil, and certainly it is attractive enough to add to any herb garden.

Marjoram is another member of the mint family, and the herb considered by most cooks as *the* most useful. It is wonderful with vegetables and is sometimes considered *the* mushroom herb. It imparts a "different" flavor to onions —baked or boiled. Marjoram is used in poultry-seasoning mixtures, in biscuits or bread dough, in omelets, soufflés and other egg dishes. Add a

(Continued on page 13)

THROUGH THE GARDEN GATE

SPECIAL SECTION

HAVE you seen the Tower of Flowers? No? Then you haven't been to the 1962 "Through the Garden Gate" sale and exhibition at Famous-Barr, Clayton. Right in the middle of the East Parking Lot is the centerpiece of this spring's sale—a 12 foot high Tower of Flowers, made of more than 1800 flowers. And that's not all! Come along "Through the Garden Gate" and see what's happening this year.

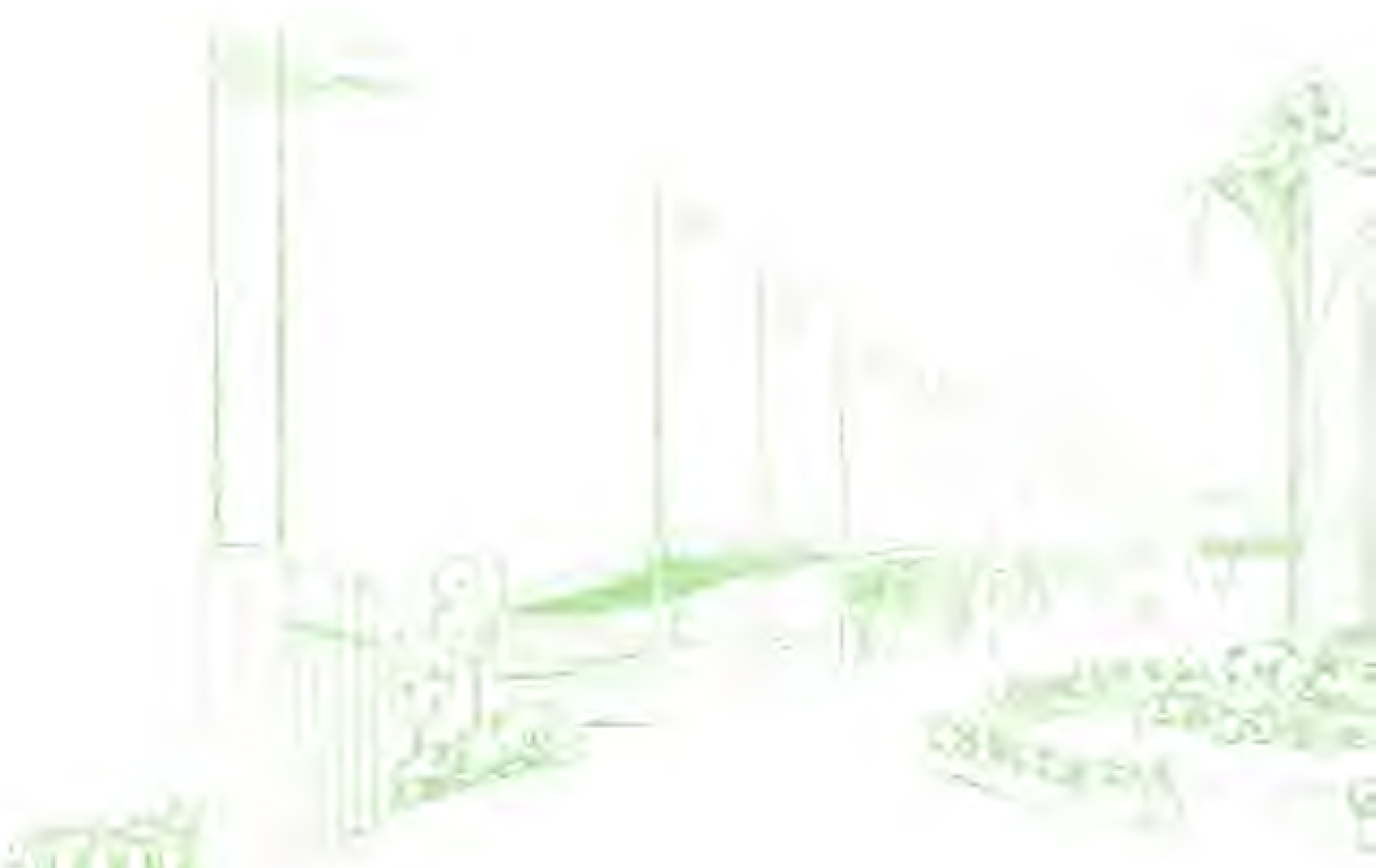
"Through the Garden Gate" will be held May 8th through 12th and all proceeds benefit Shaw's Garden. Last year's sale was so successful that this year the "Garden Gate" will be open for five days instead of three, so that more people will have a chance to visit with Shaw's Garden experts and see all the exhibits, as well as to select from the more than 50,000 plants which are offered for sale.

All of the plants have been grown in Shaw's Garden greenhouses by volunteers under the direction of Mr. Paul A. Kohl, the Garden's Horticulturist. Members of the Women's Association and several Garden clubs have been working all year on the Garden Gate for this spring. And their work of tending plants has not stopped; for during the sale, there is a special station wagon shuttle service between the Garden Gate and Shaw's Garden to bring a constantly fresh supply of plants to the sale, direct from the greenhouses. All plants offered for sale are thus in prime condition.

Of the 50,000 plants in all which are for sale, 14,000 are annuals and perennials and 6,000 are herbs. There are 32 varieties of annuals, 20 of perennials, and 7 of ground cover. Twenty-seven kinds of herbs will be offered, and also some rare tropical plants which have been grown in the Climatron.

The Tower of Flowers includes in its 1800 brilliant flowers a brand new geranium called "Pink Magnificent." This is the first time it has been shown. Another attraction at the Garden Gate this year is the VIP Booth—Very Important Plants from Very Important People. Plants offered for sale here have been sent to the Garden Gate by celebrities in a number of fields. Actors, movie stars, singers, writers, and government officials all are included in the roll of those who have sent plants to the Garden Gate. You can buy a plant sent by Bob Hope, Pat Boone, Frankie Avalon, Lily Pons, Joan Crawford, John Dos Passos, or Lyndon Johnson. And there are many more to choose from; just step right up and name your celebrity!

The Climatron Booth, new this year, offers plants which have been grown in the tropical environment of the Climatron. Another booth features bees in a demonstration of honey-making, quite safely hidden behind a sheet of glass so nobody can get stung. Fresh honey is offered for sale here. The "Answer Man" is back again this year to help solve thorny garden problems and give helpful hints on home gardening, and Mrs. John Bodine will offer flower arranging demonstrations each day



Come Through The Garden Gate
Sponsored by the Women's Association
and Famous Barr Company

between 10 A. M. and noon, with a demonstration of Japanese *bonsai*, dwarf tree culture, on Thursday.

The Herb Booth, sponsored again in cooperation with the St. Louis Herb Society, features 27 varieties of common and rare herbs, as well as some rare herb foods like melon chutney, mint sauces, herb tea, and several kinds of herb vinegar. The Herb Cafe has been enlarged this year and includes in its menu some special herb soups, salads, and sandwiches. For the men in the crowd, an added attraction is the special "dish for men," which will be included in the evening menu each day.

Three new booths offering merchandise for the garden and patio have also been added to the Garden Gate. "Summertime St. Louis" features colorful and unusual terrycloth parkas, hats, and bags, shown exclusively in St. Louis at the Garden Gate. The "Crafty Hand" is selling handmade objects and "Backyard Boutique" offers more items for outdoor living.

"Through the Garden Gate" begins at 9:30 Tuesday, May 8th, and continues through Saturday, May 12. It will be open until 9:30 P. M. every day except Saturday, the 12th, when it will close at 5:30 P. M.

It is impossible to thank individually each of the more than 2000 persons who helped make "Through the Garden Gate" a reality this year. Without the help of these people, whose labors in the greenhouse, on the telephone, in the booths, or wherever they were needed, have done so much to get the "Garden Gate" open this year, there would have been little to show for all the planning done earlier.

Special thanks are given to Mrs. Jean W. Mason, General Chairman of "Through the Garden Gate"; to Famous-Barr Company and the Women's Association, co-sponsors of the exhibition; to the St. Louis Herb Society and the many garden clubs whose members have helped grow the thousands of plants for the sale; and to the committee chairmen, whose names and committee responsibilities are given below: Mrs. Charles L. Teoker, Publicity; Mrs. William D. Perry, Posters; Mrs. George T. Pettus, Horticulture; Mrs. William P. Chrisler, Sculpture and Leading; Mrs. Charles A. Brandon, Women's Association Booth; Mr. Elbert Dean, Trees and Shrubs; Mrs. Tracy Shade, Ground Cover; Mrs. Jean S. Langenberg, Cafe; Mrs. William E. Vesser, Kitchen; Mrs. Frank Vesser, Cashier; Dr. Henry Allen, "Answer Man"; Mrs. John S. Lehmann, Geraniums; Mrs. Raoul Panteleoni, Celebrity Plants; Mrs. Jerone Kircher, Annuals and Perennials; Mrs. John Bodine, flower arranging; Mrs. Edwin Stuessie, Climatron Booth; Mrs. T. Randolph Potter, Mr. William A. Bernoudy, and Miss Edith Mason, Tower of Flowers; Mrs. Wayne Bigler and Mrs. Eric P. Newman, "Touch of Elegance," "Backyard Boutique," and "Summertime St. Louis" Booths; Mrs. Max Mason, Herbs; Mrs. H. C. Griggs and Mrs. William T. Keiffer.

(Continued from page 8)

pinch to vegetable soup, and to the cooking liquid for poultry, veal, or lamb.

Marjoram was a "must" in medieval gardens when marjoram tea was considered a tonic for upset stomachs. It was a favored strewing herb and was also useful for scrubbing furniture. It is a medium-strength herb which has such a delicate, soft, aromatic flavor that it can be used with a free hand. It, like chervil, enhances the flavor of other herbs in blends; it's a good mixer. It is a perennial, but will not winter outdoors in our climate. However, it's so easily started from seed or cuttings that you can treat it like an annual; or you can bring several plants indoors and use them throughout the winter, before replacing them in the garden when the weather becomes mild.

Marjoram is a Mediterranean native; its name comes from two Greek words meaning "joy of the mountain." Its grey-green leaves are dainty and oval, its tiny blooms are white, and it grows about 12 inches tall. It was a symbol of married love to the ancient Romans and Greeks—and is such an aid to the cook that it continues to contribute to happy married life.

Thyme, still another member of the mint family, was known at least 4,000 years ago. The Greeks considered "to smell of thyme" the greatest compliment of elegance. The Romans used it as a flavoring agent and as a medicine. It was a popular strewing herb. In the Middle Ages, ladies gave their knights sprigs of thyme to help them keep up their courage. In herbal medicine thyme cured melancholia, nightmares, and insomnia. Thyme is one of the sweetest of herbs. It seems literally to exude sentiment. According to old-time stories, fairies lived in banks of wild thyme and the bees, which adore its tiny blossoms, buzzed the fairy babies to sleep. "I know a bank whereon the wild thyme blows," wrote Shakespeare in "A Midsummer Night's Dream," and some of that play's magic seems to have rubbed off permanently on this small, dainty herb which belongs in every garden.

Thyme, which comes in many varieties, is a perennial; but the plants should be replaced every few years when they become woody. It can be started from seed or cuttings. It does best in a well-drained sunny location, and requires sweet soil. It is a medium-strength herb, yet is quite pungent so must be used with caution. It is considered a meat herb, and goes with lamb, beef, veal, fish, or poultry. Thyme is considered to have a special affinity for clam chowder. It is used with eggs, soups, sauces, stuffings, and in biscuits and dumplings. Thyme honey is a famous delicacy.

There are hundreds of varieties of savory, but only two are of special interest to the cook. These are *winter savory* and *summer savory*, both members of the mint family. They are sort of "kissing cousins" of sage, and winter savory has been called the mild sage. They will not take the place of sage in cooking—it is firmly intrenched—but if you are afraid of sage's strong flavor, you may find one of the savories a satisfactory substitute, using winter if you want a strong effect, summer if you seek something mild. Winter savory is a hardy perennial and is such an attractive plant that it could be used for low-growing accent or border, if for nothing else It is easy to start from cuttings and does best in light, sandy soil. In medieval days, it was favored for its peppery taste; the Romans made a sauce of savory and vinegar which was used as we use mint sauce. Today, winter savory is used in sausage and poultry seasoning.

Summer savory is an annual, easily grown from seed. It grows best in well-worked loam. Considered a delicate herb, it is known as the "green bean herb," because of its special affinity for that vegetable. It lends its subtly aromatic flavor to pork, veal, fish, chicken, soups, salads, rice, and beans of all varieties; rubbed on meat before cooking, it brings out flavor. Savory is often blended with thyme and marjoram. Both savories can be used with eggs, poultry, sauces, soups, meats, green vegetables—just remember their relative strength.

Tarragon belongs to the aster family and is native to western Asia. There are two tarragons—one Russian and one French, but it is only the latter which has the qualities which have made it a culinary star—one of the most tempermental, one might add. Tarragon is one of the most ancient herbs; it has changed almost not at all since it emerged from the primeval slime, and, like ginger, it has lost the power to set seed, so that propagation must be by cuttings from existing plants. The Crusaders carried tarragon back to England when they returned from the Holy Land and for a time it was restricted to royal gardens.

Tarragon grows in a bushy manner, about 2 feet or taller. Its narrow leaves are a bright, light green, in the chartreuse family. Once established, a plant should be left alone; it may or may not submit to being moved. Dr. Anderson at the Garden says, "If you have a tarragon plant that's doing well, just thank God and leave it alone." On the other hand, gardeners who don't know any better have often moved and divided their plants successfully! Tarragon requires a sweet soil; either add lime or work in eggshells from your kitchen.

Tarragon's delicate yet penetrating odor, which reminds one of licorice, accents vegetables and fruits alike; it is perfect with deviled eggs and fish salads. It is a sophisticated accompaniment to fish, chicken, mushrooms, salads, and sauces, and it gives a lift to broccoli. As previously noted, it combines with chervil to produce a flavor which is typically French. It makes a peerless vinegar; try it when you make poppy seed dressing.

Rosemary is an herb of great appeal which has been known for centuries as the Christmas Herb. It belongs to the mint family. Rosemary is the great romantic of herbs. Surrounding it are some of the most charming legends, in a field which abounds with the mystic. Rosemary's very name—from the Latin, *ros maris*, meaning "dew of the sea," conjures up visions of faraway places, evoking a sense of beauty and unfolding mystery. Like so many herbs, it is native to the hot, sunny lands of Asia Minor and the Mediterranean. It grew, for example, in Palestine, where one of its loveliest legends began.

This story concerns the blossom of rosemary, which is tiny and inconspicuous, until you note its heavenly blue, pale as the distant summer sky. This blue began, so legend has it, when the Virgin Mary, on one of her journeys of mercy about the Holy Land, touched a rosemary plant in passing and the blue of her cape brushed onto the herb's bloom. Later, in the Middle Ages, these legends multiplied.

Spicy, fragrant rosemary is a tender, evergreen perennial which must spend our winters indoors. It is a tallish plant, reaching a height of 2 or 3 feet in our climate. It has needle-like leaves which are a soft-bright green on top, and a lovely silvery-grey below. Its odor is sharp and bold, with a piney tang, somewhat akin to sage and thyme and midway between the two. It needs good drainage and does not like to be crowded too close to other plants, although in my garden it seems to appreciate the protection of a brick or wood tie wall. It needs plenty of sun and resents cultivation because of its shallow roots. It is most easily propagated by cuttings rooted in sand.

Rosemary was used by ancient Arabs and Egyptians to edge their exotic rose gardens. I think Solomon must have been thinking of the mingled fragrance of roses and rosemary when he sang: "Awake, O North Wind and come thou South; blow upon my garden that the spices thereto may flow out." Greeks and Romans strewed it about their banquet halls and planted it, as a symbol of eternity, near the tombs of the dead. In early England it was placed in bridal bouquets to denote love, happiness and fidelity; now, on Armistice Day, the English place sprigs of rosemary upon the graves of their war dead. And it was in England that the legends and customs surrounding rosemary grew. Sprigs were entwined in garlands and wreaths which decorated the homes at Christmas and remained until Twelfth Night. Rosemary "trees" were hung with gilt balls and used as decorations; the boar's head was garlanded with rosemary when it was carried to the festive holiday board.

Rosemary came with the colonists to America and its customs were remembered at Williamsburg and in Colonial homes. It flourished in the great herb gardens of the Middle Ages, when herbs were vital to cuisine, health and housekeeping; it had its place in culinary, physic and pleasure gardens alike. It was used as a seasoning agent, as a strewing herb, as a perfume, and as a moth repellent in the *garde-armoire* in which the lords and ladies of the castle hung their chain mail and wimples. It had the power of countering witchcraft, and the great beauty, Elizabeth of Hungary, used it as an ingredient of Hungary Water, which is still for sale and still credited with the power to "ensure beauty and make age a mere flight of time."

There are many other herbs which are equally fascinating. There is sage, of which the couplet says, "To live for aye, eat sage in May"; and periwinkle, endowed with mysterious powers against "wicked spirits"; borage water which "maketh a man glad and merry" . . . caraway which "restoreth hair where it hath fallen away." Or sweet woodruff which "is good for healing all sickness that come from heat: the drops of dew lie a long time on this herb." But you'll find your own favorite herbs, and discover their powers for younself. And the better you know them, the more you'll agree that their charm lies in their simplicity, their acceptance of less-than-perfect surroundings, and their affinity for everyday foods.

KNOCK AWAY, GALLANT SOLDIERS, AND AUNT LUCY

EDGAR ANDERSON

SOME of our most picturesque common names for plants have come from corruptions of the scientific name. There is in south Texas a handsome little tree with white flowers and red and yellow berries, *Ehretia anacua.* This has been corrupted locally to "Knock away" and this name has begun to spread; It has even got into a book.

"Aunt Lucy" as a common name for *Ellisia nyctelea* is closely tied up with the Missouri Botanical Garden. When the late John Kellogg began to do intensive collecting for the Garden in the southern part of the state, he found a whole community of people who called this not very bothersome weed "Aunt Lucy" By inquiring around he discovered that the Garden's first director, Dr. William Trelease, had collected in that very area a quarter of a century earlier and "Ellisia" had gradually slipped into "Aunt Lucy." This amused Mr. Kellogg and when he lectured or took people on field trips he passed on the story, so that the name became current and was quietly published by Dr. Julian Steyermark in his *Spring Flora of Missouri.* Now it is passing into general use.

The plant for which "Gallant Soldiers" became the common name in England was associated with the Royal Botanic Garden at Kew. It was a species of *Gallinsoga* which was inadvertently introduced from Peru at Kew and eventually acquired this charming corruption of the scientific name. Several species of Gallinsoga have spread up into the United States from Latin America and though one of them, *Gallinsoga* ciliata, has become an ugly and aggravating weed over most of the United States (reaching New England by 1866), it has achieved no common name and is known to few people. Perhaps now that Sir Edward Salisbury, a former Director of Kew, has put the whole story in a charming book about weeds, this jaunty name may gradually take hold in the United States. In such ways as these, by having a name which comes immediately to mind, we come into greater awareness of the interesting world about us.

* * *

BOOK REVIEW

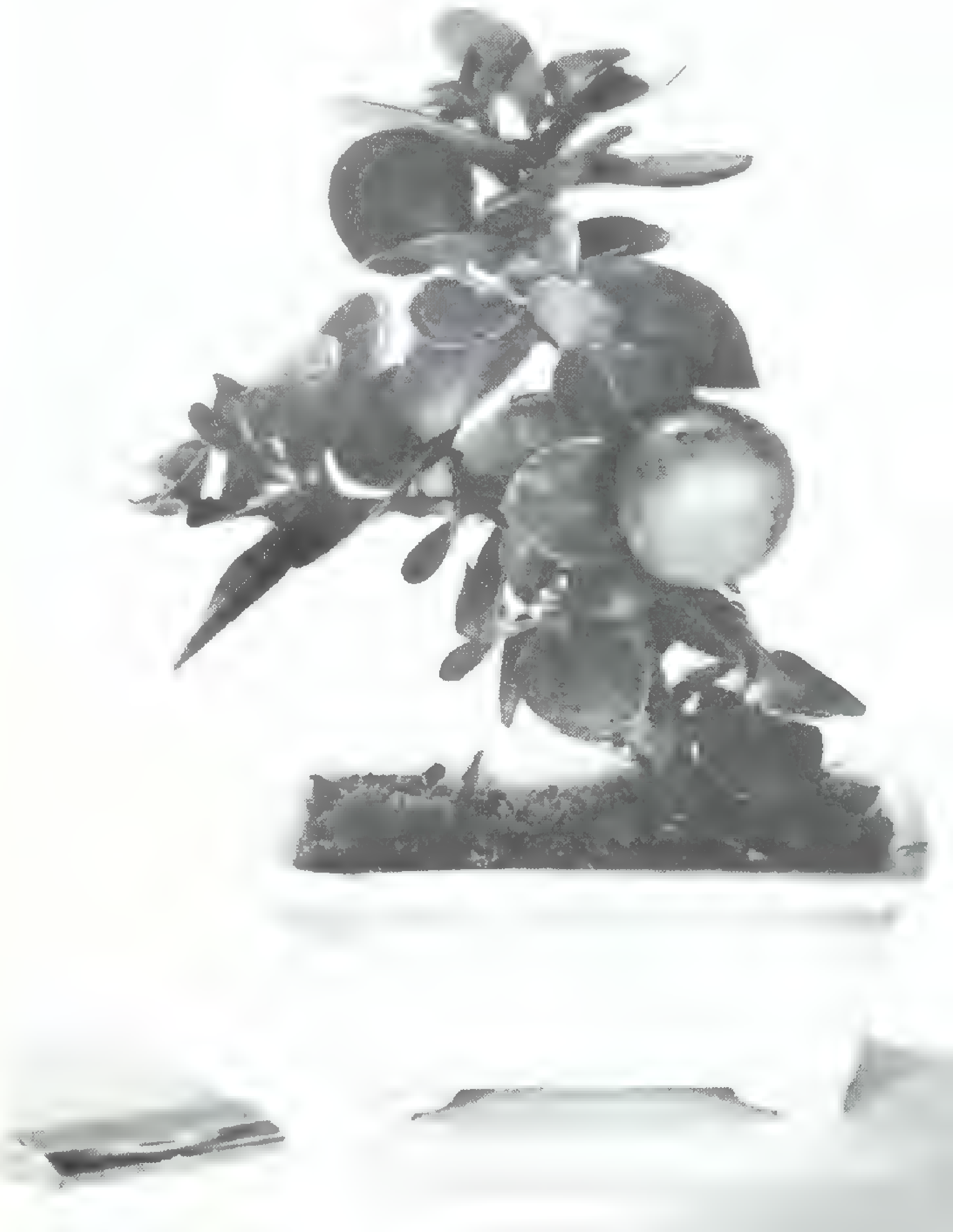
The Art of Training Plants, Ernesta Drinker Ballard. Harper & Bros., New York, 1962. $4.75. 48 plates, 1 color plate.

THERE are few genuine authorities on houseplants; it takes time and a real flair for the subject to try out any considerable number of them successfully under the exacting conditions of a real home. Most of the books about houseplants are written by men who grow them in greenhouses and have had relatively little experience with them in living rooms, kitchens, and hallways. Mrs. Ballard is one of the few exceptions. She has a greenhouse of her own but she tries out her potted plants in her home and on the garden terrace in summer, so that she knows from personal experience what you can and cannot do with each one.

From these experiences have come two books, *Garden in Your House*, published by Harpers several years ago, and now this 128 page book which has just appeared this spring. Both are written in a clear-running English prose which makes them a delight to read or consult, and both are packed with detailed factual information about the plants she discusses. The first of these takes up houseplants in the broadest possible way; the latter is an extension of her interest in *bonsai* (Japanese dwarf trees). It tells much about *bonsai* and how they are made and cared for but it deals with a far larger subject, how to train and care for all kinds of "potted plants decoratively grown," to use Mrs. Ballard's own phrase. It deals with everything from little miniatures, not 6 inches high, pot and all, to a handsome *Grevillea robusta*, 7 feet tall in a large decorated urn.

Traditional *bonsai* are woody shrubs and trees which cannot be kept in the house in the winter time, yet must be protected from temperatures much below 30° F. Mrs. Ballard grows them well and has built for them an attractive lean-to shed whose plastic panels come out in the summer time.

Over half of the book (and 33 of



One of Mrs. Ballard's "miniature *bonsai*." A tiny branch of Natal plum *(carissa grandiflora)* was rooted from a mature flowering specimen. The rooted cutting was groomed and transplanted to a small holder and has ripened one of its scarlet berries. The match book indicates relative size.

PHOTO: EDMUND B. GILCHRIST, JR.

the 49 plates) is given up to a chapter on "Some decorative plants." She begins with traditional *bonsai* and then passes on to what she calls "tropical *bonsai*," woody houseplants of tropical or sub-tropical origin which can be readily grown in the house during the winter and kept either there or on a porch or terrace in the summer, becoming lovelier year by year if they are properly cared for. They are, Mrs. Ballard points out, both cheaper and easier to grow than genuine *bonsai*. She advises amateurs without horticultural experience to start with them rather than with hardy *bonsai*. When you have learned to keep these cheaper, more tractable plants "alive and decorative, it will be time enough to invest in hardy *bonsai*."

Herbaceous plants, she points out, need more drastic treatment and are best thrown away when they get ugly, though if groomed properly they may be "decoratively grown" for three years. There are sections on "Succulents in Ornamental Containers," "Dish Gardens," "Epiphytes on Driftwood" and "Standards and Cascades." The remaining chapters take up Pruning and Shaping, Root Pruning and Potting, Watering, Soils, Fertilizing and Pest

Bonsai—A five-needle pine from the Brooklyn Botanic Garden.

PHOTO: BROOKLYN BOTANIC GARDEN

Control with a final listing of books and sources of supply for plants and special containers. There is an excellent index.

The finest feature of the book is its all-pervading honesty. The plants are clearly photographed to show what they were actually like instead of being artfully posed to look better than they really are. The reader's attention is called to the fact that the begonia in figure 16 is one-sided: "So are all *bonsai* and most house plants. Except in shows, there is no advantage to perfectly symmetrical growth. I find the daily quarter revolution recommended by many texts to be time consuming and often ineffective. In winter time I turn my plants only as necessary to prevent complete topsidedness. I am satisfied to have a plant develop one attractive side, which can be turned to face the guests on state occasions."

To the average apartment house gardener one of the most heartening pictures in the book will be figure 37, which shows an old-fashioned rubber tree three months after the top eighteen inches of the stem had been pruned off. It has been stimulated into vigorous new growth; two branches have come out and a third is on the way. Mrs. Ballard concludes "One more removal of the terminal bud may be necessary before this left lateral branches out in earnest. If all goes well, these lateral branches will soon transform the plant from a juvenile whip to a mature-looking tree." This plate is proof that the old family rubber plant does not have to be abandoned when it gets too tall for the apartment. It can be transformed into something much more decorative which will last for many years.

As one turns the pages of this book and looks at the photographs of Mrs. Ballard's plants (including a few from the homes of friends) one gets the impression that these plants would indeed be decorative in American homes. They are not slavish copies of oriental subjects and techniques. The underlying principals of *bonsai* culture have been mastered and then tastefully adapted to American plant material and American homes. That is evidence of real creative ability.

EDGAR ANDERSON

TOWER GROVE HOUSE HOSTESS TRAINING PROGRAM

IN a gratifying response to the Historical Committee's invitation, over 100 persons took part in the Tower Grove House training program for volunteer guides. The orientation program to acquaint prospective hostesses with the Garden, Henry Shaw's life, and Tower Grove House was highly successful and it appears that the hostess problem will be solved as soon as those who volunteered arrange the times they will serve.

Dr. Went opened the all-day program with a celcome from the Garden, and Dr. Anderson followed with remarks on the history of the Garden and its development from Henry Shaw's country estate into one of the world's foremost botanical gardens. Dr. Cutler discussed Henry Shaw's life, and after an intermission, Mrs. William T. Keiffer demonstrated Victorian flower arrangements. (Tower Grove House always has fresh flowers in its rooms). After a box lunch under the trees, Mrs. Roland Jester, Consultant from the Missouri Historical Society, discussed nineteenth century furniture and American decorative arts, after which she led a tour of Tower Grove House. The program closed with a tour of the Climatron and Garden led by Mrs. Paul Britt. The Historical Committee is deeply appreciative of the willingness the volunteers have shown to keep Tower Grove House adequately staffed, and looks forward to a successful summer.

FRIENDS OF THE GARDEN NOTES

Now that we are in the midst of the gardening season, it is appropriate that Friends be reminded of a new service of the Friends office at the Main Gate. The "Gardeners' Swap Board," installed in January and largely unused up to this time because few persons noticed the announcement in the BULLETIN, can help solve problems of supply and demand in your garden. This simple device is a bulletin board in a central location upon which Friends can post their garden needs and surpluses. If you have an overstock of one kind of plant and perhaps would like to get more of another, simply put a note to that effect on the board and see if you find anyone to trade with. It is also a good idea to keep an eye on the board, to see what else is needed or offered.

This board is for the use of Friends only, and rules for its use are available in the Friends office. Why not try it? —it's easy, fun, and perhaps even profitable!

◆

Another activity of interest to Friends, the popular Indonesian Dinners, will be resumed in the near future. The popularity of the six dinners held earlier was such that there is still an immense waiting list, and it is certain that as word gets around, more Friends will want to "go Indonesian" for a night and enjoy the rare flavors of an authentic Oriental dinner. Watch the BULLETIN for more information.

◆

Finally, an appeal for help on a matter that causes us some embarrassment: the problem of delinquent dues. For some time now the members of the Friends Executive Council have been serving as an informal volunteer telephone committee. Their practice is to make a friendly reminder call to each member of the Friends who is three months delinquent in making an annual contribution (such members have already received a renewal notice, but sometimes renewal notices get lost or overlooked, and often a telephone reminder, in the right spirit, is welcome). The backlog of delinquents is getting ahead of the telephoners, and anyone who will volunteer to join them in this tedious but most important task will be very welcome, indeed. Calls may be made at home, and the list mailed back to the Friends office when completed. Delinquency is a serious problem—last year it cut deeply into membership growth of the Friends, and if we are to avoid getting into the classic situation of the frog in the well, who slipped back two hops for every one he made, we must have an effective means of solving it. At the moment, telephoning each delinquent seems the best way, if we can get the telephoners to help do it. Volunteers, please!

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 10:00 P. M. Tower Grove House is open daily from 9:00 A.M. to 5:00 P.M. (April through November); 10:00 A.M. to 4:00 P.M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

May 1962
Volume L
Number 5

COVER: Two eager youngsters make leaf prints in last summer's Pitzman Nature Program, using paper, ink, a bottle for a roller, and leaves they collected on a walk through the Garden. Registration for the first session of this year's Pitzman Program is June 18th.

PHOTO BY BRIAN GORDON

CONTENTS

Late Season Vegetable Gardens

Spiny Plants

Pitzman Summer Nature Programs

Book Reviews

New Members of Friends of the Garden

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: BRIAN GORDON.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden
Volume L No. 5 Bulletin May 1962

LATE SEASON VEGETABLE GARDENS

KENNETH O. PECK AND EDGAR ANDERSON

To the well organized, efficient vegetable gardener who has long since prepared his soil, set out his plants and seeds and is by now well along toward reaping the first fruits of his labors, we have nothing to say, except, "Power to you, and the Lord protect you from rabbits." This article is addressed to those fellow gardeners whose vegetable garden is so far only a weed-grown corner in the yard and a gleam in the eyes. Some people in this category don't really intend to plant anything at all, but will just read catalogues and dream. But to those of you who, though tardy, are serious, we have words of encouragement. Don't give up for this year; there are still many vegetables you can grow, even in the midst of a St. Louis summer.

Aside from deciding which vegetables to grow, the most important things to consider are the location of the garden and the preparation of the soil. The best vegetables can be grown in full sun and in well drained soil. Shade from houses, trees, and other obstructions must be avoided, but the garden should be convenient to the house and to a supply of water.

Soil preparation is most likely the reason why more people do not indulge in some kind of gardening, since it is plain hard work, but it is the singularly most important aspect of a garden. A garden area which exceeds 200 or 300 square feet is best cultivated with a power tiller or a small garden tractor with a plow. Heavy soils and extremely sandy soils need the addition of some kind of organic matter to improve the soil structure; this organic matter may include manure, brown peat moss, or well shredded leaf compost. If manure is used, it should be applied liberally just before cultivation. Brown peat moss or leaf compost, if used, should be spread over the soil in at least a 3-inch layer and then worked in thoroughly. Whatever is done to improve soil structure should result in a well drained soil, since plant roots literally "drown" if the soil is not well drained. (Soils that hold water for more than a day or two are considered to be poorly drained). The water remaining in the soil after a heavy rain deprives roots of oxygen which is necessary for plant processes of metabolism, water absorption, and growth.

A high yield of vegetables requires a high level of soil fertility. An application of commercial fertilizer with a 5–10–5 or 4–12–8 analysis would be quite suitable at the rate of 4 or 5 pounds per 100 square feet. Fertilizer is most easily spread by hand from a pail and may be worked into the soil during the final work on soil preparation, several days before planting.

Any gardening operation requires a

certain number of tools. The following tools are almost indispensable for even a small dooryard garden: a hoe, a 12- or 14-tined steel rake, a round-nose spade or fork, a watering can, and a sprayer. For making neat looking straight rows, a heavy garden line must also be included.

Every garden must be planned, even if only a small number of vegetables are to be grown. Plants should be spaced to permit free movement in the garden for cultivating and harvesting. For example, tomatoes can be planted with 18 inches of space between rows and 30 to 36 inches between plants in the row, whereas bush beans need only 12 to 15 inches between rows and about 4 inches in the row. There are numerous books, charts, and magazine articles that can be referred to to find the recommended spacing of plants.

The late season gardener may experience some difficulty in buying tomato plants or onion sets, and may have to resort to vegetables that are always started from seed, such as bush and pole beans and sweet corn. Seeds may be planted to a depth equal to 4 or 5 times their average diameter. Lima or snap beans would then be planted to a depth of 1 to 1½ inches. Sweet corn, an exception, is often planted 2 inches deep.

Soon after planting, the garden can be mulched with 2 to 4 inches of wheat or oat straw, grass clippings, ground corn cobs, or some similar organic material. Mulching will help conserve soil moisture, reduce the number of weeds, and prevent puddling and compaction of the soil surface. Before spreading the mulch, sprinkle the soil with a little ammonium sulphate to compensate for nitrogen loss due to the action of bacteria in decaying an organic mulch.

Insect control is a must for good vegetables. There are a number of commercial preparations, both dusts and liquid sprays, especially concocted for vegetable garden use. Insecticides should always be applied in accordance with directions given for the product in question.

If you are to have a successful and efficient vegetable garden in St. Louis you must accept the heat, particularly the hot nights and the hot dry winds that can blow out of Oklahoma for days at a time in our worst summers. It is possible to plant heat-loving vegetables and heat-tolerant varieties that will come through our worst summers acceptably. Unfortunately the books about vegetable gardening all seem to be written in the East and North. Those of us of English or German descent would do well to visit with our Italian-American friends in their vegetable gardens and learn as much as we can about varieties and techniques that trace back to Italy's long, hot, dry summers.

Plants for St. Louis Gardens

Parsley. Plain or Single Parsley (sometimes known as Flat Italian) will stand the heat much better than the beautiful Moss Curled varieties. Plant the latter in a pot in late August and transplant when the seedlings are big enough to handle; it will give you parsley for the late autumn and, with a little protection, for the winter and spring to come. The Flat Italian has much better flavoring for salads and other dishes However, it is more tender and will be completely killed by the first hard frost.

Lettuce. Oakleaf is the most heat resistant high quality lettuce for the home garden. If not started in early spring it is better to sow it in a flat or large flower pot in early August. This plant can be nursed day by day or even hour by hour through the hot weather, pricked off into a flat, and then into the garden in early September. It can take quite a lot of frost and with a little protection will grow into fine big heads long before a real freeze sets in. The heads may be lifted, set in a box with sand or vermiculite, and kept in the basement for a few weeks.

Okra. Okra loves the heat and does not mind dry weather if it is watered occasionally. It is a handsome looking plant something like a hollyhock, and the seed pods bring a good price from florists and decorators. If you think you do not like okra, try mixing it with sweet corn and sweet peppers, or with string beans or tomatoes. In each case a little of it adds to the quality of the other vegetables. Do not plant until hot weather; it needs heat to get started. By picking the okra very small the plants will keep on blooming and the vegetable will be of the highest quality. Learn to cook it in different ways. Try cutting it into narrow strips and then cutting these into lengths of a little less than an inch. Braise it in a hot iron skillet in butter or margarine, shaking on a little flour from time to time to take up excess moisture. Season with salt and pepper (and tabasco sauce if you like it).

Cucumbers. For St. Louis the best solution is to buy them in a supermarket. The varieties on the market obviously were not bred for this climate.

Sweet Corn. Of the Golden Bantam types, Ioana, one of the hybrid varieties, is particularly suited to St. Louis. If squirrels are common in your neighborhood, the chances are strong that they will get most or all of the crop.

Witloof Chicory (French Endive). Chicory grows very well in St. Louis and makes large plants if you thin it farther and farther apart as it matures. It needs to be blanched: Take up the plants and set in boxes of sand or vermiculite, set it in the darkest part of the cellar and water it a little from time to time. It will make white and yellow shoots, three to six inches long, which are excellent in salads or in a meat sandwich, and it should last you until Christmas time or thereabouts.

Lima Beans. Plant only the baby limas of the Sieva race which will stand the heat. Sieva or Carolina are good varieties. Potato will outyield these, but has purple spots which make the beans look dark when they are cooked. Pole varieties will greatly outyield bush varieties in hot climates. Make a tepee of poles and string for the vines to grow over.

Green or Snap Pole Beans. Plant in the same fashion as lima beans. Kentucky Wonder and Romano are two heavy yielders in the St. Louis area.

Tomatoes. Tomatoes normally present no problems to growers in this area. It is not unusual to have so many tomatoes from a half a dozen plants that one experiences difficulty in giving them away. Several varieties widely grown in this area are Marglobe, Rutgers, and Big Boy. Somewhat less commonly grown is Firesteel, which produces a fine medium-sized fruit just right for salads.

If, after all the encouragement and guidance presented herewith, it does not seem feasible to start your vegetable garden this year, the next best thing might be to observe and follow the progress of some other garden The garden we have in mind is the vegetable garden that 32 children are going to tend this year at the Garden. This garden, which is divided into 16 plots measuring 8 by 10 feet, is located just south of the Experimental Greenhouse. It is expected that the return for their efforts will be very rewarding, and we encourage all interested persons to see our newest project.

SPINY PLANTS

F. W. WENT

It is interesting to see how resourceful nature is, and how with only a few basic attributes a whole host of structures and functions have been developed. Take for instance the extremities of mammals. Whereas ordinarily the forepaws are legs for walking, in man they have become arms, in whales, fins for swimming, in moles spades for digging, and in bats wings for flying. In plants we find that the same organ, for instance a leaf, can change from a device for catching light to a pitcher for catching insects, to a bract or petal for catching our breath with its colorful beauty, or to a climbing or food storage organ.

As the plant collection in the Climatron becomes richer, we will find more unusual adaptations which are particularly numerous among tropical plants. In fact, there is so much to be seen in the Climatron that a single visit is not sufficient. From season to season many changes will be apparent, and besides, plants grow with such rapidity that each visit, whether a month or half a year apart, will give a new impression. In addition we have a weekly change in the concert program which is presented daily from 12 to 1 and from 4 to 5.

We have just completed and sent to press a guide describing some of the interesting plants a visitor will see in the Climatron. But since such a guide, to be complete, would be unwieldy, we will complement it from time to time with information in the BULLETIN.

This month we will discuss spines in plants. In many cases they serve as a protection against the plant's being eaten by animals. Such protective spines are especially common in desert plants (cactus) or plants from other dry areas, such as the spiny shrub areas in northern Mexico or southern India. But in other cases, spines enable plants to climb high up in trees to reach the light, which is dim on the forest floor. The thorns of the rose are a good example of such "climbing" spines.

We shall see that many different plant parts have been transformed into spines in order for plants to become spiny, whereas in the example of the adaptation of the front leg in higher animals the same organ served many different purposes—a homologous development instead of the analogous development of the spiny plants.

In many cases, spines are just pointed outgrowths of the stem (as in roses) or of leaves (the giant water lily, *Victoria cruziana*, has such leaf spines all over the protruding veins or ribs on the underside of its leaves). Mimosa stems, and sometimes their leaves, are spiny and some climbing mimosas attach themselves with these spines to the surrounding vegetation so that they can climb high up in trees. Such mimosas, with thorns irregularly placed along stems or leaf ribs, form impenetrable thickets in tropical forests and are described by such local names as "wait-a-bit."

The stipules (small leaflets located on each side of the base of true leaves) of a number of leguminous plants, such as mesquite (*Prosopis*, a desert shrub) and *Acacia cornigera*, have been transformed into spines. In the latter plant the spines are very big and hollow, and in their native country (Mexico), ants live in them.

The base of the stems of a gourd from the East Indies, *Neoalsomitra*, is strongly swollen and very spiny. In this case the spines are nothing but leaf stalk on which the leaf blade did not develop. Where these swollen stems gradually taper down to the regular climbing stems, one can find all intermediate stages between simple spines, spines with the rudiments of a leaf blade still attached on top, and almost normal leaves.

A similar but more complicated case is that of the ocotillo *(Fouquieria)*, a desert shrub which forms bundles of whip-like stems which carry long and hard spines. These spines are the lower half of the leaf stalk of the primary leaves. The leaf stalk splits lengthwise upon the death of the leaf, which drops off with the upper part of the soft leaf stalk, leaving the hard lower pointed part attached to the stem. Therefore both in *Neoalsomitra* and in *Fouquieria* the spines are very regularly spread over the stem, where in other plants the leaves would be attached.

In other plants, such as oranges and lemons and bouganvilleas, the spines are transformed axillary branches which start to form in the axils of the leaves but soon stop growing and become very hard and pointed. Sometimes one can see the rudiments of leaves attached to these spines or, very rarely, they develop partly into a normal shoot, with a few small leaves but still pointed at the end. In one of the giant bamboos, *Guadua*, the whole young lateral shoot, with the sheath leaves tightly rolled into a very hard and sharp point, acts as a spine, but later these spines may grow into normal side branches—which again have lateral branches as spines. Just for good measure there are small thorns on the main stem as well.

In many plants the leaf edges are stiff and spiny; the common holly is a good example. There are many other plants with spiny leaf edges, such as barberry and a lot of plants from western Australia. (Watch for these when we have built our Australian greenhouse next to the Climatron).

The most conspicuously spiny plants are the cacti—a whole family of thousands of plants characterized by spines, and spines of a very peculiar kind. Instead of having one or two spines at a time, the cacti have spines in whole bundles, grouped together in so-called *areoles*, areas all over the surface of the strongly swollen stems in places where normally the axillary buds should be located. In most cases these cactus spines will attach themselves more strongly to your flesh than they will hang on to the cactus and therefore, after accidental contact with a cactus, *you* become the spiny one and it is quite a chore, and quite painful, to remove all these spines from an arm or a leg. The worst cactus spines are those of the cholla cactus, since they are double, with a very hard and sharp inner core which drives the loose outer sheath into your flesh. When you are trying to pull these spines out (and they can penetrate very deeply), the outer sheath usually stays in your flesh and often causes festering before it comes out. Burbank's much publicized efforts to breed a spineless cactus have been only partially successful, since only the size of the spines has been decreased; there are still as many of them as on their spiny ancestors. Cattle will eat these (spineless) prickly pears only under duress.

There are lots of spiny fruits, such as chestnuts, prickly pears and castor beans, and many seeds are distributed because their spiny fruits or burrs attach themselves to socks or legs (puncture vine, cockle bur, Cenchrus, etc.). In the case of teasel *(Dipsacus)*, the whole inflorescence or flower head is covered with spine-like bracts, which formerly were used in the carding of wool.

In some cases stiff long hairs may act as spines, such as in the case of the nettle and Mucuna vines. The difference between a spine and a hair is that the latter consists of only a single cell, whereas the spine is a multicellular structure and usually is much bigger. The stiff hairs of many plants of the borage family can be very disagreeable when you are picking them, and hairs of many *Loasaceae* produce painful rashes. But the most peculiar case of stiff hairs is that of several bamboo species (e.g., *Gigantochloa*). The stems and sheaths are covered with brown hairs which usually are closely appressed against the stem surface. These bamboo stems are commonly used for building houses, furniture, ladders, etc., and when these hairs are not carefully rubbed off, one becomes itchy all over when sitting on such a bamboo chair or climbing a bamboo ladder. It is claimed that these bamboo hairs, when regularly mixed with food, will penetrate the walls of the intestines, causing festering and even death. In the Far East it is claimed that such bamboo hairs are used to murder people. Before the invention of the microscope it was practically impossible to check on this, but I very much doubt that this method of poisoning is effective or being used. In the few cases I have been called in to check for the expected presence of bamboo hairs in the stomach content of patients, I did not find any; the hair-like structures were muscle fibers from meat. When stiff hairs have barbs on them, they can attach themselves to surfaces or other hairs and thus a plant with barbed hairs can climb or can be distributed by animals. Most members of the genus *Galium* have such hairs, and thus their weak herbaceous stems may climb between other plants. When barbed hairs occur on seeds, they become entangled in wool or fabrics and can be carried for long distances. The pod segments of *Desmodium*, and the pods of *Krameria* are good examples.

The most curious case of spininess I know is that of the flower bud of *Euryale fero*, a tropical water lily with large, somewhat spiny leaves. When these plants are growing in abundance, they may completely cover the surface of a pond, leaving no place for the flowers to reach the surface. In the big *Victoria regia* and *Victoria cruziana*, the leaves all radiate from the center of the plant, leaving an open space in the middle for the flowers to float on the water surface. But this is not so in dense stands of *Euryale*, where leaves overlap (since they have no upturned edge like *Victoria* leaves). The flower bud of *Euryale* is sharply pointed, penetrates the leaf, and opens above the leaf. Thus we see the curious phenomenon of beautifully dark blue flowers borne on large leaves like salvers or platters.

PITZMAN SUMMER NATURE PROGRAM

At the time of year when parents are wondering what is available for their kids to do during the summer, it is appropriate to mention the Pitzman Summer Nature Program at Shaw's Garden. Registration is June 18th for the first session, but a little forward-looking may eliminate the need for an expensive summer camp, or the prospect of having bored and list-

less children around the house as summer wears on.

This will be the fifth summer of these free summer nature classes for children, sponsored by the Pitzman Foundation. A record attendance is anticipated and the program is being expanded this year to include more activities related to participation instead of just listening. This year, children will be able to do more things on their own and individual research will be emphasized more than organized classes, for those who would like to pursue a special interest.

The four classes to be taught are Birds, Plants and Man, Trailfinders, and Man's Enemies. Children can register for all of them or they may just take the courses which interest them. Birds will again be taught by members of the St. Louis Audubon Society; the other courses will be taught by Kenneth Peck and his assistants.

In the Birds class, children learn about the habits of birds and how to identify several kinds which they might see in Missouri. Part of many class periods are hikes to the wild part of the Garden to look for birds. Quail are quite easy to see, as well as songbirds.

Plants and Man class teaches the relationship between man and nature, and in this class everything from flower structure to cereal grain planting is taught. Children pot plants in one class period, dissect a flower in another, and learn about different kinds of corn in a third.

Trailfinders class teaches how to identify many kinds of trees and other plants, including poison ivy. Hikes through the North American Tract of

Pitzman Program Activities PHOTOS: B. G.

the Garden are a regular feature of the course, as well as leaf printing with paper and ink so that children can learn the shape of different leaves.

Man's Enemies class covers both plants, insects, and larger animals which are harmful to man and his garden crops. In this class, students are taught insect structure and types so that they can recognize many common insects, both harmful and helpful. Collections of butterflies and moths are made as part of this course and children make their own butterfly nets. Poisonous plants and mushrooms are also included in the class schedule.

The Junior Research Teams, made up of students who show special interest in nature, investigate several subjects outside the regular class periods. They meet at the Garden on days regular classes are not given and carry out research either individually or as teams. The nature of their research varies from year to year, but a look at last summer's subjects may be an indication of the sort of subjects dealt with: Some children learned how to collect, press, and mount plants for an herbarium; several experimented with photobiology and saw how light affects plant growth. (They planted lettuce and rye seeds and grew them under various light conditions to see how plant development changed under different colors of light and varying direction of light). Other students who were interested in drawing made sketches of trees and plants in the Garden; those who were more interested in insects dissected grasshoppers and made sketches of them. And a few learned how to take pictures and develop their own film while studying tree shapes through photography.

Pitzman classes will be held Tuesdays and Thursdays, morning and afternoon, with a supervised lunch hour. The research teams meet on intervening days, either in the morning or afternoon. All programs are free to all children between the ages of 7 and 16.

The Pitzman Program is given in two five-week sessions; registration for the first is June 18th and for the second, July 23rd. Children who attend the required number of class meetings receive a certificate of achievement for the classes they attend.

Although registration for the first session is not until June 18th, it is possible to register now by telephone. To register or learn more about the Pitzman Program, call the Garden at TO 5-0440.

BOOK REVIEWS

Flowering Trees of the World for Tropics and Warm Climates, Edwin A. Menninger, with a foreword by B. Y. Morrison. 425 color plates and 40 line drawings by Eva Melady. Hearthside Press, Inc. New York, 1962. $18.95.

Now that we have a Climatron, where tropical plants grow as if in the tropics, St. Louisans are beginning to realize some of the things they have missed. The flowering trees of the tropics and sub-tropics furnish spectacles which are beyond anything we can match in the temperate zone. Some of them exhibit their choice flowers against a background of rich dark foliage, as do our own southern magnolias. Others are like our redbuds in flowering profusely when the branches are bare of leaves. To have seen a mature yellow Tabebuia in full bloom, its frilly trumpets crowding the bare branches, stirred gently by passing air currents so that the whole tree becomes a dome of living gold, is something to remember with emotion.

These ornamental trees of tropical gardens, parks and avenues have been a frustration to the visiting botanist or gardener, amateur and professional alike. There are so many kinds of them and it is so difficult to get any information about them. There has been no general book to tell what they were or where they came from and when and how. A few of them are native to the country in which you see them and will be in a book on the flora of that country, if one has been published, but many if not most of them are introduced plants which do not naturalize themselves readily in their new home and so are outside the scope of a native flora. Mr. Menninger's book therefore fills a long felt want. It is expensive, but that must be expected in a book which has 425 color plates (the best of them excellent, all of them passable) and 40 commendable line drawings in black and white.

Mr. Menninger, after studying at Columbia University School of Journalism and working on the N. Y. *Tribune*, moved south and for several decades published his own newspaper at Stuart, Florida. As the son of Dr. C. F. Menninger, the founder of the Menninger Foundation (who as a young man was a teacher of botany and other sciences), he had a strong bent towards science and natural history.

With little notion of what a tremendous task he was undertaking, Menninger started to find out which were the best ornamental trees of the tropics and which of these would grow and bloom in Florida. Even when he learned that he would have to dig out his own information bit by bit, he stuck to the task. He read the accounts of early naturalists like Richard Spruce, one of the first Europeans to explore the Amazon region; he plowed through the technical accounts in published floras of tropical areas, page by page, for the occasional mention of the beauty of certain trees; he searched libraries for books (this volume of his has a meaty bibliography of 148 titles); he got in touch with nurseries dealing in tropical and subtropical plants; he wrote botanical gardens all over the world; increasingly as time went on, he wrote directly to men and women here and there who already knew something about tropical ornamental trees (some of these he got in touch with by ingeniously writing U. S. Consular agents abroad for the names and addresses of likely contacts).

A few short introductory chapters tell of his experiences in learning about tropical ornamentals and in getting them growing successfully in Florida. Nor did his troubles end there. Significantly he has an information-packed chapter on "beautiful trees which are difficult or impossible to flower in alien lands"

Cannon-ball tree *(Couroupita guianensis)*

The bulk of the book is the harvest he has made from these decades of effort; it is full of references to the authors he has studied, to his experience, and to his correspondents from all over the world, nearly 250 of whom are listed by name and address in a special supplement It was to these correspondents that he turned for help in picking the outstanding trees which should be included in this volume. He asked each one to make a list of "the 10 or 15 loveliest native flowering trees" in his part of the world. About 800 different trees were nominated and Menninger reduced the list to a "manageable 500." However, he has included so much information about related species (32 species of the coral trees *(Erythrina)* are listed and discussed) that by my tally at least 815 different species have been listed along with some pertinent information.

As a kind of rough key in placing the tropical flowering trees one may encounter in his travels, he has listings which cover 10 pages of the appendix and which serve several useful purposes. They are listed by color of the flower (with separate lists for those whose flowers are of more than one color in each bloom and for those "chameleon trees that change the color of their flowers from hour to hour or from day to day"). These are lists of "flowering trees with variegated leaves" and of those whose leaves show color other than green or whose juvenile or withering leaves are striking in their color effects. There are excellent lists of special features; that is to say, "growth habits, cultural or habitat needs, aesthetic or practical usefulness to mankind, or other properties." The headings are worth quoting; they help indicate the scope of the book:

"1. Cauliferous—Flowers often pop out on trunk and branches.
2. Difficult To Grow—Even experts fail. Maybe you can succeed.
3. Wind Resistant—They stand up best against a storm's buffeting.
4. Salt Resistant—They like growing near the sea or in salty soils.
5. Giant Trees—They are too big to plant in anybody's yard.
6. Small Trees—Pick from this list if your house is on a fifty-foot lot.
7. Fragrant Flowers—These appeal to the nose as well as to the eye.
8. Bad-Smelling Flowers—Avoid planting these near human habitations.
9. Shade Makers—They provide ample shade as well as handsome flowers.
10. Shade Bearers—These trees will grow underneath other trees.
11. Fast Growing Trees—Plant them and then get back out of the way.
12. Slow Growing Trees—Worth waiting for if you are in no hurry.
13. Objectionable Roots—They sprawl over the surface of the ground.
14. Fireproof Trees—Bark thick enough to ignore the hottest blaze.
15. Dryland Trees — These never bother about drought conditions.
16. Wet Land Trees—These are often happiest when growing in a swamp.
17. The Thorny Ones—Be careful.
18. Fragrant Leaves—The Myrtle and Laurel families are noteworthy.
19. Poisonous Trees—No hard and fast rule —approach cautiously.
20. Trees To Eat—Leaves, flowers, or fruits have palate appeal.
21. Timber Trees—Which might grow too big for ornamental use.
22. Commercial Possibilities—These provide many useful products."

As another aid to travelers or newcomers in the tropics, he chooses 19 tropical regions (such as Colombia–Panama, Amazonia, Hawaii, and Mexico) and for each he lists the 10 most beautiful trees which are likely to be found there. There are also separate tabulations of the trees which are known to have survived temperatures of 25 to 32 degrees Fahrenheit and of those which have even survived 20 degrees.

Almost two-thirds of the volume is given over to a discussion, tree by tree, of the 500 choicest flowering trees. They are arranged alphabetically according to family, from the *Acanthaceae* to the *Zygophyllaceae*. Under the family they are listed alphabetically by genera. The approved scientific name is given first, followed by any synonyms which are common in horticultural or botanical literature. Here the author has had competent technical assistance. Where Menninger has been able to get it the lowest temperature the species is known to have survived is indicated. The common names are given if it has been possible to find any in English or Spanish (after all, the true common names of trees from Malaysia or from the Amazon basin would be relatively little use to us,

Clusia grandiflora

even if we could find them). There are quotations or opinions of those who have seen the trees in bloom, a short description of the flower and frequently of the tree itself, together with such information as the history of its discovery and its introduction into Florida. For trees which have been grown by the author or his collaborators, there are discussions of its likes and dislikes, its ease of cultivation and frequency of bloom, related species or genera with which it might be confused, and other points of technical or general interest.

This section of the book is, in fact, packed with winnowings from the rich harvest of interesting and useful information which Mr. Menninger has been able to accumulate during his quarter-of-a-century search. The descriptions are frequently graphic. In discussing the Cannon-ball tree *(Couroupita guianensis)* he writes of the flowers that they are "six inches across, an ornamental fat yellow three-inch pincushion, flanked by six fleshy red petals. Some authors have suggested that they look more like a mousetrap or a comb and brush set."

The book closes with a final chapter on "Flowering Trees Which Were Left Out of the Book" either because the flowers are too small to notice or because they are merely freakish (as for instance those of the Sausage Tree *(Kilgelia pinnata)* or because, however beautiful they may be, the plant which bears them never becomes anything but a shrub (Camellias, for example). Others do not qualify because, like the Sterculias, though they have handsome seedpods, these pods follow inconsequential flowers.

There is finally a good 13-page index. It includes all the trees discussed or referred to in the book under both their scientific and common names (insofar as Menninger has been able to find common names in English or Spanish) and all the people quoted or referred to.

From the index one can make a sort of ranking of Mr. Menninger's collaborators by counting the number of times each of them is referred to. David Fairchild leads with 18 references. Richard Spruce and A. Ducke are tied for second place with 12 each. Then in order come Ernest Lord, the author of *Shrubs and Trees for Australian Gardens*; Dr. Paul C. Standley, for many years on the staff of the Chicago Museum of Natural History; Wilson Popenoe, who introduced the avocado and many other tropical plants into the United States; and Paul Allen of the United Fruit Company, who received his early training here at the Missouri Botanical Garden.

For those of us who are now associated with a Climatron it is a great privilege, right now, to have a book of such calibre on such a subject. Most of us have not lived and worked in the tropics (more than fleetingly, that is) and Mr. Menninger's volume tells us just the things we want to know about some of the loveliest species in the Climatron. EDGAR ANDERSON

Orchids: Their Botany and Culture, Alex D. Hawkes. Harper & Brothers, New York, 1961. 197 pp. $6.95.

IN view of the tremendous interest in growing orchids, it is surprising that there have been so few attempts to write books giving general information on the family. As the first attempt in English in many years, Mr. Hawkes' book is bound to receive a good deal of attention and much use. The book is divided into four main sections: The Orchid Family, Culture, The Principal Cultivated Orchids, and Hybrids and Hybridization, plus an appendix and a glossary.

The first section gives general information on the orchid family—distribution, habitat, and a superficial treatment of plant and flower structure. This portion, then, includes much of the "botany" which the title leads us to expect, but in this area, the book is something of a disappointment. A botany of the orchid family should give accurate and fairly detailed information on anatomy, cytology, ecology, genetics and flower structure, as well as something of physiology, all subjects of great value to the grower as well as the botanist; but the present work either omits these subjects entirely or covers them only in a very superficial manner. In this first section the term "mimicry" is misused, as it so often is in reference to the orchids, though true mimicry does occur in this fantastic family. Here, too, it is suggested that the *Orchidaceae* is the largest of all plant families with 24,000 different kinds (not counting artificial hybrids) and more than 48,000 names. This is certainly a very liberal estimate. Most authors guess from 12–15,000 species of orchids, considerably fewer species than are recorded for the sunflower family. I do not doubt that there have been more than 48,000 names published, but the orchids, even more than most other plant groups, have been cursed with a series of would-be botanists who seemed to feel that publishing new names would somehow increase our knowledge (or their prestige), whether the names were needed or not. For this reason, the number of published names gives an exceedingly poor guide to the number of species actually existing.

The second section, on culture, is mostly quite good, though the chapter on orchid diseases is so general as to be nearly useless. Some reviewers have found the cultural information a bit too general, or a bit "dated," but I doubt that anyone can do much better on this scale. When orchid culture was essentially limited to Europe one could write a general work on orchid growing which (right or wrong) would meet with the approval of most other growers. Now there are orchid growers scattered from Iceland to New Zealand, and the orchids are being grown under glass, plastic, lath, trees and open sky. We are now beginning to realize that orchids can be grown in anything from glass beads to bottle caps, but that each climate, each medium, and each type of orchid will require different growing conditions. Under these circumstances a "World Encyclopedia of Orchid Culture" would be endless, and would surely be out of date before the day of publication.

The third section of the book, "The Principal Cultivated Orchids," is the largest and will be the most valuable for most orchid growers. Here one finds general information on culture and distribution for one hundred selected genera; under each there are brief, readable descriptions of one or a few representative species. Most of the genera are illustrated, and the photographs are mostly very good. In several cases the illustration shows a species which is not described or mentioned in the text; this to me, at least, seems a defect. Most growers will appreciate the clear pronunciation guide which accompanies each generic and specific name, and the suggested pronunciations are mostly quite reasonable, though the diphthongs *oe* and *ae* from European names get rather strange treatment. There is not, of course, any absolute standard for the pronunciation of botanical names. Botanists may be roughly divided into the classicists, who prefer the original Latin pronunciation (no two ever agree on what it should be), and those who prefer to anglicize the pronunciation (and that is chaos). One of Mr. Hawkes' fetishes (in addition to pronunciation) is the correct use of botanical names, and on this score his work is a good deal better than other non-botanical books. However, he tends to leave the reader with the impression that orchid classification is very well known, that each kind of plant has one correct name, and that there is no doubt as to what that name is. Actually, his use of the generic names *Bletilla*, *Cattleyopsis*, *Chondrorhyncha*, *Euanthe*, *Laeliopsis* and *Rhyncholaelia* and the listing of *Cattleya dowiana* as a variety of *C. labiata* range from botanically dubious to absolutely wrong.

The section on Hybrids and Hybridization is comprehensive, though the chapter on "Mechanics of Hybridization" would have been clearer if there had been a better treatment of flower structure, and here, too, a good chapter on genetics would have added greatly to the value of this section.

The appendix includes a chapter on "Names and Classification," which will be helpful to the non-botanist, and a "Phylogenetic List of the Orchidaceae," which looks deceptively scientific. This list is based on the system of orchid classification which was developed by Rudolph Schlechter and published in 1926, after his death. Nearly every botanist familiar with the orchids will agree that a major fault of Schlecter's system is that he had too many subtribes; yet Mr. Hawkes has managed to increase the number from 80 to 88, though no explanation is given for the changes. Happily, the subtribal names in Mr. Hawkes' list are given the correct endings for subtribe names, though many recent authors have used Schlechter's original form, which is very confusing (but not really Schlechter's fault, as there had been little attempt in his day to clarify the terminology of subfamily, tribe and subtribe, all categories usually used only by the specialist). Also, Mr. Hawkes has resisted the temptation to promote all the subtribes to tribes, thus compounding the confusion (and perhaps making the family sound bigger and even more important) as some authors would do. It is unfortunate that the higher categories of subfamily and tribe are omitted from Mr. Hawkes' list, so that the reader gets no overall picture of orchid classification. The order of the subtribes is presumably significant in a "phylogenetic" list, but in many cases it is difficult to see why a particular order was followed. In spite of the fetish of botanical accuracy, I find fifteen subtribal names in this list which are incorrect, ranging from misspellings to names which have never been published. The subtribes Corallorrhizinae, Dendrobiinae, Polystachyinae and Trichocentrinae, as listed by Hawkes, are all botanical hodge-podges, each including genera which are only distantly related to each other; while many natural groups are split into several or many "subtribes." The subtribe which forms my own special interest, the Epidendrinae, is listed as three separate subtribes, though the separation is botanically indefensible. Under "Laeliinae" we find the name *Fractiunguis*, while the correct name for this same genus, *Reichenbachanthus*,[*] is listed under "Ponerinae." Similarly, *Epidendrum* is listed in the "Laeliinae," while the very closely related genera *Diothonaea* and *Jacquiniella* are placed in the "Ponerinae." Not only is the subtribal distinction unclear, but the order of the genera within each "subtribe" seems to be without significance. It is difficult to see how one could put *Phajus* and *Bletia* in separate subtribes, especially if *Ipsea* and *Spathoglottis* are placed with *Phajus*. But it is in the *Oncidium* alliance that natural relationships are most brutally shattered. The very natural group around *Oncidium* is broken into ten "subtribes" which undoubtedly belong together (and others which are debatable). Here again, the order is rather unclear. In spite of its faults and inconsistencies, the phylogenetic list will aid the grower in forming some idea of the genera which might possibly form viable intergenetic hybrids, and in this it will be useful.

Finally, the author includes a six-page glossary which is reasonably comprehensive and quite readable, and adds considerably to the value of the book. In summary, the "Orchids: Their Botany and Culture" falls far short of what the title leads one to expect, but it at least tries to fill a long-felt need, and there is little likelihood of its being replaced in the next few years.

ROBERT L. DRESSLER

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[*] Admittedly, the author of any name like this should be court-martialed and shot on the spot, even if the orchid isn't likely to be cultivated much.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 10:00 P. M. Tower Grove House is open daily from 9:00 A.M. to 5:00 P.M. (April through November); 10:00 A.M. to 4:00 P.M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year other shows, competitions and festivals are sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

June 1962
Volume L
Number 6

Cover: A group of school children enjoying the water-lily pond in the Climatron. Several kinds of water-lilies are now in colorful bloom. PHOTO BY BRIAN GORDON

CONTENTS

A Tour of
Shaw's Garden

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

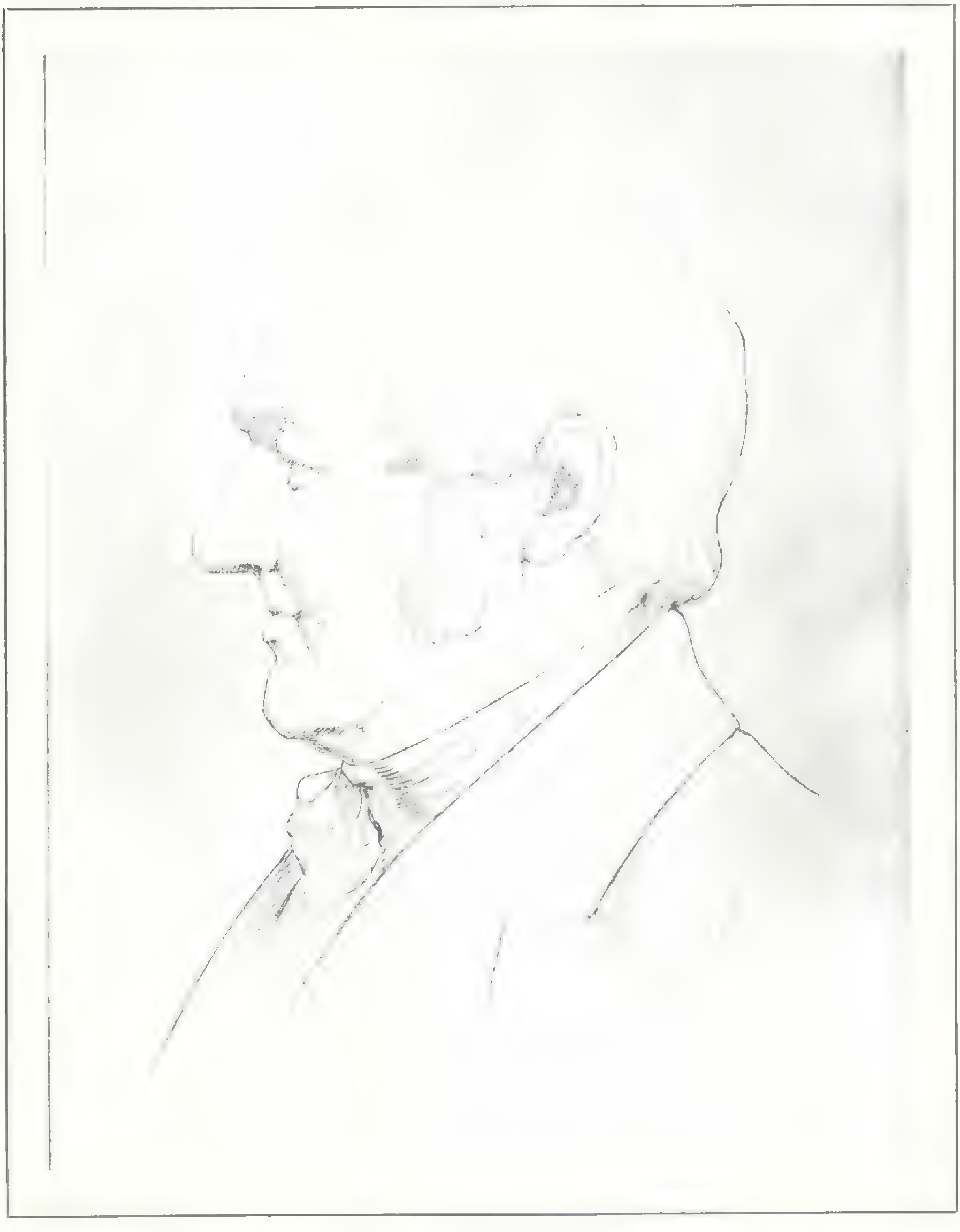
Guest Editor for this issue: Edgar Anderson.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Volume I No. 6 June 1962



Henry Shaw 1800–1889

A TOUR OF THE MISSOURI BOTANICAL GARDEN

We are often asked, "What is a botanical garden anyway? Is it a park, and if so why not call it one?" In answer it may be said that a botanical garden may sometimes look like a park but it is much more than that. It is a place for collections of different kinds of plants and a center for studying plants and for diffusing information about them. One phase of its work is to arrange displays for the delight and instruction of the general public. While there is always something interesting to see at the Missouri Botanical Garden there are also special displays at certain seasons both out of doors and under glass. In addition there are a number of important features which are not ordinarily open to the general public. These include: a large botanical library and herbarium (O),* which includes a laboratory for graduate students; an administrative and editorial office; a small greenhouse (R) which is used as a temporary center for the Garden's educational program; the Cleveland avenue Gatehouse (Q), which is a private residence; the growing greenhouses (S), where plants are raised for the displays.

The Garden is hidden away on the East and North by Mr. Shaw's sturdy old-fashioned limestone walls so high that the passer-by catches only glimpses of tree-tops or of vines which spill down over the gray-white stones. One enters through the Main Gate (A) on Tower Grove Avenue (opposite the head of Flora Place) or by the Cleveland Avenue Gate (B) a few blocks to the south. Incorporated in the Main Gate is the quaintly lettered keystone from the original gate. It bears the official designation selected by Henry Shaw, Missouri Botanical Garden, and the date of its erection, 1858.

To the right of the entrance are Rest Rooms for Men and for Women. To the left and side by side are the Headquarters for the Friends of the Garden and the Bookstore and Information Center. The latter has an unusually wide selection of books and pamphlets pertaining to gardening, wild flowers, botany, and horticulture. There are also postcards of various features of the Garden. For the convenience of visitors there is a public telephone just outside the turnstiles.

Visitors may want to visit for a moment at the Friends of the Garden office to learn something of how this voluntary membership organization supports the Garden in its work. Friends members receive a number of special benefits, including free admission to the Climatron, a free subscription to the Garden Bulletin and a discount on items for sale at the Information Center. In return, their annual dues enable the Garden to carry on a wide variety of programs to bring gardening information to the public in the form of courses, lectures and demonstrations.

Immediately before the entrance

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* Capital letters refer to map on pages 8 and 9.

Facing Page: The Linnaean House as seen from the Rose Garden.

Below: Avenue of Dawn Redwoods *(Metasequoia glyptostroboides)*. These are the fastest growing of all conifers but were known only as fossils until living groves of them were found in China in the 1940's.

stretch the TROPICAL LILY POOLS (C) featuring from July until frost a fine display of tropical water lilies. In the early morning and late afternoon and on cool damp days, the night-blooming water lilies hold the stage with their waxy petals of pink, red, or white. All of these varieties have been developed at the Garden. The glory of the display however is given by the day-blooming tropical hybrids. These magnificent flowers, wider than dinner-plates and in exquisite shades of yellow, pink, lavender and blue, have largely been developed at the Missouri Botanical Garden by Mr. G. H. Pring.

Facing us across the lily pools is the world's first CLIMATRON (D), devised by the Garden's Director, Dr. Frits W. Went. Dramatic enough during the day time, it is spectacular when illuminated at night and reflected in the lily pools. Though it closes at 5 P. M. Mondays through Thursdays, it and the adjacent buildings stay open until 10 P. M. on Fridays, Saturdays and Sundays, and major holidays. The tropical foliage and flowers with which it is filled are even more brilliantly dramatic when seen by artificial light.

Leaving the Climatron for the moment we take the angling path to the right into the ROSE GARDEN (E), at its loveliest in May and June but attractive at all times of the year by reason of its excellent design. The center of the Rose Garden is a converging point for all the main pathways in this part of the Garden and in whichever direction one looks a vista opens. To the west is the shrub-bordered walk ending in the arched entrance to the FLORAL DISPLAY HOUSE (F). Particularly noteworthy is the treatment of the vista to the south. In this direction one looks down rose-bordered stretches of turf to the flowering shrubs of the KNOLLS (G) and sees in the distance the square white tower of Mr. Shaw's old country home, TOWER GROVE. To prevent a discordant crosswise streak through the center of the picture, the landscape architect had the land to the south so graded that the water lily pools and attendant walks are out of sight from the Rose Garden.

In the opposite direction is the LINNAEAN HOUSE (H), the only remaining greenhouse which was erected in Mr. Shaw's day. It is so named because it bears over its main entrance portrait busts of three outstanding botanists, Nuttall at the west side, Asa Gray of Harvard at the east, and crowning the gable, above an appropriate inscription, the great Swedish botanist, Linnaeus. The building itself is of interest as one of the few remaining examples of middle nineteenth century greenhouses. It is filled with a collection of Camellias and other winter-flowering shrubs, planted to simulate an outdoor garden, and from January to March is in continuous bloom.

Down the angling path to the southwest we see the Climatron again straight ahead of us. Proceeding along the pathway we pass on our right a strange winter-blooming tree, *Parrotia persica,* whose hundreds of small black

Facing Page: The tower, the second story balcony and the white gate posts all date from Henry Shaw's day.

velvet buds open in late winter, revealing the bright red stamens within.

The CLIMATRON (D) is the world's first controlled-climate greenhouse. The chief problem in attempting to grow tropical plants outside the tropics, is not keeping them warm in the wintertime but keeping them cool in the summer time without sacrificing any of the bright sunlight to which they are accustomed In the Climatron this is accomplished by huge fans which change the air every few minutes and by bringing in air through a water curtain in hot weather.

The Climatron was developed by Dr. Frits W. Went, Director of the Garden, in consultation with St. Louis architects Murphy and Mackey. It is built according to principles established by R. Buckminster Fuller, inventor of the Geodesic system. It is 70 feet high, 175 feet in diameter and covers a quarter of an acre.

The Missouri Botanical Garden receives no direct tax government support. The admission charge of 50 cents per visitor will maintain the Climatron and help provide support for additional development of the Garden. Children 14 and under are admitted free when accompanied by an adult. Groups of children (schools, scouts, etc.) are admitted free regardless of age and are allowed free admission for two adult leaders per 25 children. All Friends of the Garden are admitted free. They present their membership cards as passes.

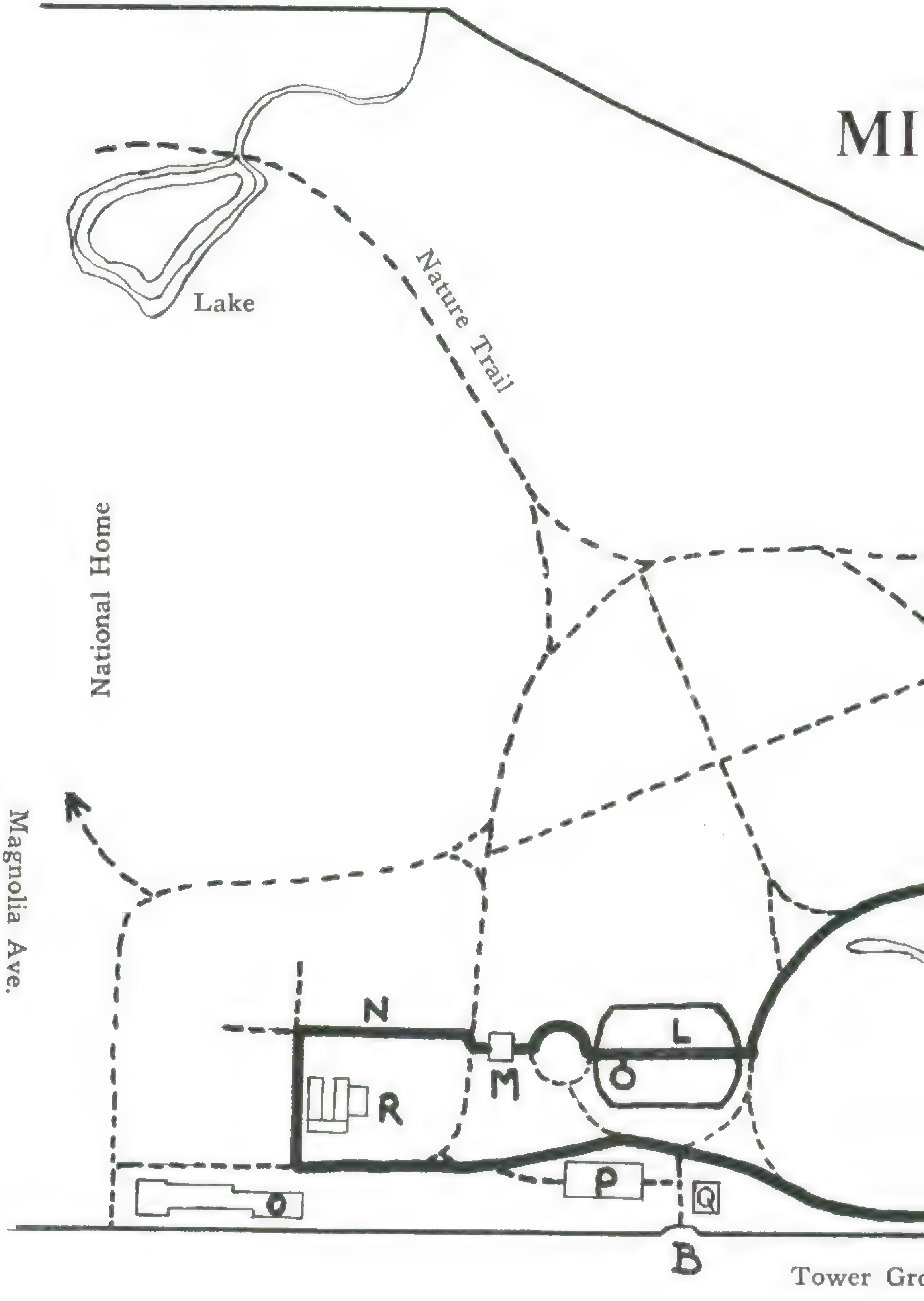
Reduced rates for adult groups are 35 cents each for groups of 20 to 100 and 30 cents each for groups larger than that.

The Climatron is a Geodesic dome of aluminum tubing arranged in hexagonal patterns, lined by a layer of transparent Plexiglass, suspended just below the underside of the dome framework. The Plexiglass is held in place by rubber gaskets similar to those used in jet airplanes. Additional material explaining the mechanical operation and the displays of the Climatron is available from the attendant.

Until new greenhouses can be built for them, two special collections are kept in older greenhouses immediately to the left and right of the Climatron. To the south of it (that is, to the right as you are leaving the Climatron) is the DESERT HOUSE (I). Here will be seen some of the most bizarre and grotesque forms of the plant world such as the Agaves or Century Plants which provide the Aztecs with food, drink and clothing. From the sap an intoxicating drink, "pulque," was fermented; the cores were roasted and eaten; the leaves were used as roofing thatch and the thorns were used for pins and needles. Some visitors who have not traveled widely in the deserts of the American Southwest and of Mexico will be surprised by the large number of shrubs in a desert collection.

To the north of the Climatron another greenhouse of the same size and shape as the Desert House is given over largely to SOUTH AFRICAN SUCCULENTS (J). The uninformed visi-

Facing Page: An Amazonian bog in the Climatron, spring of 1962. The conspicuous-veined *Sanchezia nobilis*, at the left, flowered all through the winter of 1961-1962.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Lake
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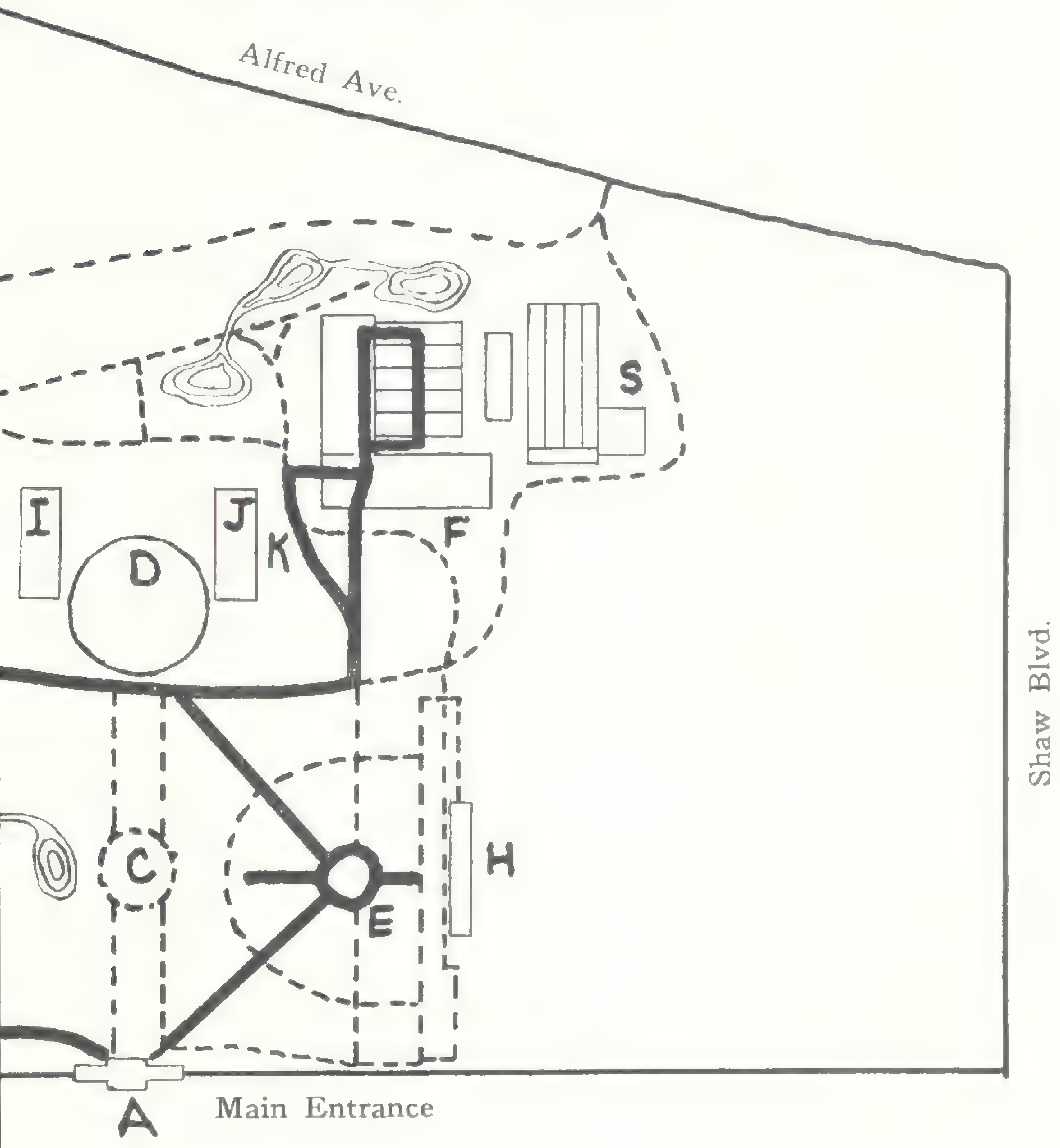
A TOUR OF THE
URI BOTANICAL GARDEN

Scale only approximate.

Heavy Line Shows Route of Tour.


Alfred Ave.
S
I
J
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Shaw Blvd.
C
H
E
A
Main Entrance

Now largely an auditorium, when built by Henry Shaw a century ago it housed Library, Herbarium, and a small Museum.

tor will wonder why when there are so many Cacti in the Desert House, so many more of them are included here. Actually *none of the plants in this house are Cacti,* however much they may resemble them. They are various kinds of plants from other desert areas, largely African, and have become so adapted to desert conditions that superficially they look like Cacti. When they flower they have utterly different flowers, some of them (the Stapelias for instance) are desert milkweeds, others are related to Lilies, many of them are Euphorbias, close relatives of the Christmas poinsettia.

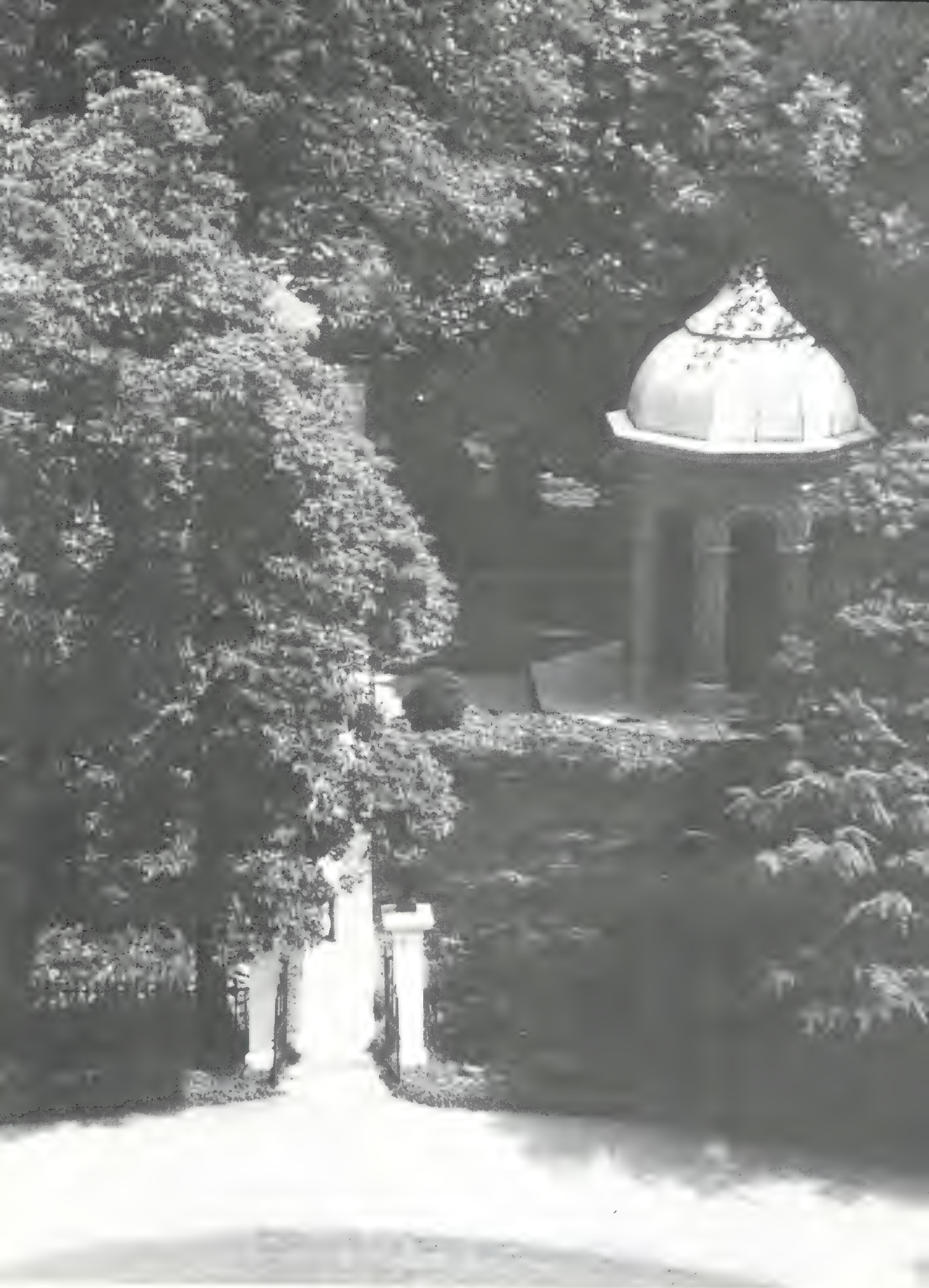
Just beyond the South African collections and still farther to the north is the FLORAL DISPLAY HOUSE (F). As its name indicates, this house is used for big displays or flower shows from October to June. Highest in popular favor are usually the Chrysanthemum show in November and the Orchid Show in February. The Garden is internationally known for its orchids and their breeding and study. They are exhibited *en masse* during the Orchid Show and are always on display in the Climatron. There is a Poinsettia Show during the Christmas Holidays and much of January. Tulip Shows, Spring Flowers, Easter Lilies, Azaleas, and finally Hydrangeas carry on until summer heat makes the house difficult for most kinds of flowers. In the spring, late summer, and fall various St. Louis plant societies stage Rose, Gladiolus, Succulent, Dahlia, African Violet Shows and the like. Each of these usually lasts for a Saturday afternoon and evening and the following Sunday.

For those who wish to see additional tropical plants (and orchids in particular) it is possible at this point on the Tour to make a circuit of the chief growing greenhouses for tropical plants. From the upper level of the Floral Display House at a door opposite the main entrance, a long flight of steps leads to the AROID HOUSE, still an interesting collection of tropical plants though it shows obvious scars where particularly fine specimens were moved into the Climatron.

At the far end of the Aroid House, turn to the right through the orchid houses. In the second one there is usually a small display of orchids currently in bloom. Another turn to the right takes us down the middle of the range of greenhouses. We then pass through the outside door, turn to the right between the two greenhouses and enter again at the foot of the same staircase we came down before.

On the upper level of the Floral Display House a series of high quality Food Vending Machines have been set up for the convenience of visitors (there are no restaurants near the Garden). These change money, offer a wide selection of sandwiches, ice cream on a stick, and hot coffee or hot chocolate, as well as cold drinks.

Just outside the south door is the RUMAHSAHTAY (K), a small restaurant specializing in Indonesian delicacies such as charcoal broiled pork tidbits (sahtay), ground beef steamed in a light bread-dough (China-burgers), and other dishes and drinks. The area between the two greenhouses has been converted into an outdoor dining terrace with small tables, metal chairs,



Above: The "Grove" seen from the "Tower." Henry Shaw's Mausoleum amid its trees and ivies
Facing Page: The "Tower" of Tower Grove. In Henry Shaw's day from this tower one could see all of the surrounding farmlands.

and large green and white umbrellas.

To see the rest of the Garden we now retrace our steps past the Climatron and continue along a pleasantly shaded walk which curves more and more to the left. Particularly notable is a fine clump of Dwarf Buckeye, *Aesculus parviflora*. It is one of the few ornamental shrubs which grow well in the shade; it is particularly beautiful in June and July when it is covered with slender tapers of white flowers rising straight up above the leaves.

Continuing along the pathway we come to the dignified old gateway which admits us to the MAUSOLEUM GROVE (L) and see TOWER GROVE (M) facing us beyond the opposite gate. A century and a half ago when Henry Shaw first saw this property, here were the beginnings of a tiny grove surrounded on all sides by rolling prairie land. As soon as he owned the land he fenced in the grove, built his house beside it, and eventually planned the stone MAUSOLEUM in which he lies buried beneath a portrait statue of white marble.

The Grove is given over to a collection of ground-covers, including Baltic Ivy and the Garden's own introduction MBG Bulgaria which has proved thoroughly hardy in St. Louis even in the coldest winters. There is a small collection of hardy Liriopes, and a particularly fine form of Wild Ginger, *Asarum canadense* var. *acuminatum*. In late winter and spring the Grove is bright with early-flowering bulbs. Snowdrops begin the parade in early or mid-February and are always showy by the end of the month. They are followed by Squills, Narcissi, and then a magnificent display of Wood-hyacinths, in pink, blue, and white. The wild blue form with drooping racemes, known and loved in England as "Bluebells," is appropriately concentrated around Mr. Shaw's tomb.

Passing out of the Grove we are confronted by TOWER GROVE, Henry Shaw's country home, named from its tall square tower and the adjacent grove. The tower and the wing to the right of it belong to the original building erected by Mr. Shaw in 1849. When, after Mr. Shaw's death in 1889, the building (which was still without running water or central heating) was made habitable for Dr. William Trelease and his family, the original servants wing at the left was torn down and more commodious quarters were built in its place.

During the 1950's with the help of various St. Louisans, Tower Grove was restored both structurally and decoratively and is now open to the public every day in the year. The basic admission fees are 50 cents per adult and 10 cents for children 14 and under. As in the case of the Climatron, Friends of the Garden and staff members and their guests are admitted free and there are lower rates for groups of 20 or more.

Particularly interesting within the house is the contrast (particularly noticeable in the woodwork and the fireplaces) between the parts built in 1849 and in 1889. The house displays among other things pictures and statuary brought back from Europe by Henry Shaw. It includes furniture from his town house as well as some of the original furniture from Tower Grove.

Immediately to the rear of Tower Grove is the AVENUE OF DAWN REDWOODS (N). These superb trees were for long known only as fossils, until living stands of them were located in remote parts of China. The Arnold Arboretum located a good source of seed and generously shared their treasure with other arboreta and botanical gardens. The avenue was set out in the early 1950's and leads from Henry Shaw's study to a tall pair of Bald Cypresses planted in his time. Passing along this walk we pause at the first cross walk and look down it to the antique statue of Juno Materna, brought back from Europe by Henry Shaw as an ornament for his garden. (Visitors desiring to reach the National Home of the State Federations of Garden Clubs on foot, will find that if they go to this statue and then proceed beyond and slightly to the left they will find a driveway leading to the National Home on Magnolia Avenue.)

Turning to the left at the crosswalk we see in front of us the ADMINISTRATION BUILDING (O), not ordinarily open to the general public. It contains offices, one of the world's finest botanical libraries, a large herbarium and laboratories for advanced students in botany. The portion of the building to the left (by looking sharply one can see where the old-fashioned bricks meet more modern brickwork) was Mr. Shaw's town house at the corner of Seventh and Locust. It was moved out here in accordance with his will and later greatly enlarged.

Turning again to the left we pass in front of the small greenhouse which is the headquarters for the Garden's Educational Program. Here and in the Museum, lectures and practical work in various phases of Horticulture and Botany are given to the public. With the aid from the Pitzman Fund the programs for children have been greatly expanded.

Continuing straight ahead we soon see the red-brick MUSEUM (P) rising before us. Here is the building erected under Henry Shaw's personal supervision a century ago when he seriously began to organize his botanical garden. It originally housed everything: offices, herbarium, laboratory, work rooms, library and museum. Now it is used for offices and for storage though its main use is as an auditorium. In addition to lectures sponsored by the Garden it is lent to organizations which are carrying on the kind of work Mr. Shaw would have liked to see centered at the Garden.

Just beyond the Museum a road to the right leads to the Cleveland Avenue Gate, opening on to Tower Grove Avenue across the street from its junction with Cleveland Avenue. Between the Museum and the Gate are fine young specimens of the rare Japanese Golden Larch *(Pseudolarix amabilis)*.

Beside the gate is the CLEVELAND GATE HOUSE (Q) built in 1890 as a waiting room where visitors met the horse drawn vehicles which took them back to the city or the railroad station at the junction of Vandeventer and Tower Grove avenues. It has since been converted into a residence and the house and its grounds are not open to

Above: An 1890 farm kitchen is now on display at Tower Grove.

the public. At its southwest corner is a good specimen of a little known tree, the Ivy Tree, *Kalopanax pictus.* As we continue along bearing to the right we note a number of trees with labels and a few with numbers. These are part of the Tree Trail. Visitors may obtain free from the Information Center at the Main Gate, an illustrated guide and map to this trail. Thousands of families have gone over this trail (parents and children doing it together) and have found it a pleasant way of finding out more about the world around us.

Continuing along the walk we pass fine specimens of the Gingko tree, a collection of hardy bamboos, Ozark Witch Hazels which are in flower for many weeks during the winter-time, Hercules Club, the spiniest of all our native trees, and a group of Japanese Snowballs, *Viburnum tomentosum sterile.*

We have now made a circuit of the principal features of the Garden and the Main Gate comes into view ahead of us. There are many things we have hurried by, and many points which there has not been time to discuss. But we should like finally at least to mention our interesting white red bud, the lake in the North American tract, and the Arboretum at Gray Summit, Missouri, on highway 66, where the Wild Flower Trails and Daffodil Collections are open to the public in April and May. E.A.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 10:00 P. M. Tower Grove House is open daily from 9:00 A.M. to 5:00 P.M. (April through November); 10:00 A.M. to 4:00 P.M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year other shows, competitions and festivals are sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

September 1962
Volume L
Number 7

Cover: One of the many trails through the Garden's Arboretum at Gray Summit, Mo., thirty miles southwest of St. Louis on highway 66. See Friends of the Garden notes for news of the picnic to be held soon at the Arboretum.

PHOTO: L. G. BRENNER

CONTENTS

Fall Lawn Care
The Feather Geranium
Fall Course Schedules
Book Reviews
Friends of the Garden Notes

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Guest-Editor for this issue: Ranlet Lincoln.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden
Volume L No. 7 Bulletin September 1962

FALL LAWN CARE

RAYMOND P. FREEBORG

WITH fall just around the corner it is time to look to your lawn for renovation—especially the lawns with the cool season grasses. This will include the bluegrass and bentgrass. These grasses have suffered through a very dry, hot summer and will require the best fall renovation program you can manage.

One of the first and most important problems to correct is the accumulation of thatch in your lawn. This thatch is made of the decaying leaves and roots of your grass plants. It serves as a breeding place for the many diseases that damage the cool season grasses. This thatch will interfere with water movement into the soil, prevent efficient use of fertilizer, and prevent the roots of the grass plants from penetrating deeply into the soil. A lawn with a heavy thatch is usually shallow rooted. When a plug is cut from the lawn the sod can easily be separated from the soil. This is because the roots are confined to the thatch layer. A lawn with a dense, deeply rooted turf is usually a healthly lawn.

This heavy thatch does not become a problem until the cool season grasses are forced to grow under stress. This would be the summer season in St. Louis. When the evenings are hot and humid lawn diseases become damaging, especially where the heavy thatch is found.

Two of the more serious lawn diseases on bentgrass are the *Pythium sp.*, and *Helminthosporium* Blight. There are no satisfactory controls for these diseases. The large brown patch, *Rhizoctonia sp.*, is another disease of bentgrass supported by heavy thatch development. A fungicide containing mercury will give excellent control of the large brown patch.

The *Helminthosporium sp.*, leafspot, is a severe problem on the bluegrass. This disease becomes active in early spring. It will be more severe with a heavy thatch development. The damage done by the leafspot does not become severe until the bluegrass is placed under stress in summer. Then circular spots of dead grass will appear in the lawn. The ActiDione or Kromad fungicides applied in early April to early June will prevent the disease from severely weakening the bluegrass plant so it can survive the stress of the hot, dry summer. However, the best preventative and control is a good maintenance program that includes thatch removal from the cool season grasses in the early fall.

There are several units manufactured for home use to remove this thatch. These are vertical cutting or thin-cutting units. The blades are set upright on a horizontal axis so they slice the turf, cutting or thinning out the thatch. This vertical cutting unit should be set so that it barely touches the soil surface. This verticutting will remove most of the crabgrass and other weeds by removing runners and seed heads, and will make next year's disease control easier.

As the thatch is thinned out it should be raked and discarded.

You are now ready to fertilize. You should have a soil test made if you have not had your soil analyzed within the last three years. Soil tests are made by your County Extension Agent. A fee of $1.00 is charged for the analysis. The soil sample should represent the entire lawn area. It is best to take your samples at various points throughout your lawn. The sample should be taken to a depth of seven inches. Mix all samples together thoroughly, then take about one pint of this mixed soil and mail it to Mr. Nelson Russell, 230 South Meramec, Clayton 5, Missouri. Enclose your $1.00 service charge. This analysis will take from seven to fourteen days.

Your soil analysis will give you the necessary information on the amount of lime, and the amount of fertilizer to add.

Nitrogen, phosphate, and potash are the three most important elements required for the establishment of a good turf. The manufacturers have blended these elements to give you many brands to choose from. These mixed fertilizers are available in many combinations. These combinations are stated in a formula on each fertilizer bag. An example would be a newly developed formula designed specifically for turf. The three combinations available are 12–3–6, 12–4–8, and 12–5–7.

The 12 means 12% actual nitrogen, the 3 is for 3% P_2O_5, phosphate, and the 6 is for 6% K_2O, potash. Thus a 50 ℔ bag would have .12 × 50 ℔ or 6 ℔ of actual nitrogen. The phosphate would be .03 × 50 or 1.5 ℔ of P_2O_5, and the potash would be .06 × 50 ℔ or 3.0 ℔ of K_2O.

Other mixed fertilizers available include 5–10–5, 10–6–4, 16–8–8, 15–10–10, 20–10–5, 5–4–0, 10–10–10, and many others.

If you do not have a soil test made, you should plan on applying your mixed fertilizer at a rate high enough to give about 2 ℔ of actual nitrogen per 1000 square feet of lawn area. In the case of the 12–3–6, 12–4–8 or 12–5–7 combinations this would amount to approximately 18 ℔ of mixed fertilizer per 1000 square feet. This rate would also provide adequate phosphate and potash for fall feeding.

One other element sometimes required in this St. Louis area is iron. This can be applied as iron sulfate or as chelated iron. Approximately ½ ℔ per 1,000 square feet of the iron sulfate two to three times per season will overcome any iron deficiency. About ¼ to ½ this amount of the chelated iron should be used. A likely indication of iron deficiency in your lawn is a general tendency toward a pale, yellowish green color. Providing this condition is not due to disease or other causes, it can be overcome readily by application of iron as recommended, and the lawn restored to its rich green color.

If your vertical cutting to remove the thatch leaves large areas that appear thin it is best to overseed. Use about half the recommended rate for overseeding. If you are overseeding bluegrass it is best to use a blend of the varieties of bluegrass that are available. One such blend would contain 50% Kentucky Bluegrass, 20% Merion Bluegrass, 20% Newport Bluegrass, 10% Park and 10% Delta Bluegrass. These blends are designed to take advantage of the best qualities of each variety. Thus when Newport is suffering from leafspot, *Helminthosporium sp.*, in spring and summer the Merion, which is somewhat resistant to the leafspot, will be green and growing well. Then when the Merion is infected by the rust in late summer and early fall the Newport is reviving from the leafspot, giving you a nice green turf. The other varieties are included to give support in periods when the Newport and Merion are inactive.

The seeding and fertilizing can be done at the same time. The vertical cutting unit can be used to work your seed and fertilizer into the soil. Run it lightly over the area after seeding and fertilizing, then water and mow as needed.

Plan on a spring fertilizing at the same rates used in fall. You can use the same fertilizer. This application should be made about mid-April, weather permitting.

Look for a recommended spring renovation program in an early BULLETIN next year.

TREES LABELED BY MEN'S GARDEN CLUBS

KEEPING plants labeled is a never ending job. In a good botanical garden it should be possible to find common and scientific names and information about where a plant comes from on any plant. Weather and thoughtless children do some damage to signs but most damage is caused by the plants themselves. Trees and shrubs grow and bury the fasteners of the labels or cover the names with new branches so rapidly that some labels must be replaced every year.

During the past ten years nearly all of our outdoor labels have been made and placed by members of the Regional Council of Men's Garden Clubs, an organization composed of all the Men's Garden Clubs of the St. Louis area. On several Saturdays this August these men were busy repairing and replacing labels on the Garden's trees. Mr. Arthur Krueger, who organized the project, and most of the men who participated in it, have also worked on plantings, exhibitions and other projects which make the Garden a more interesting place to visit.

A prize for fund-raising, in the form of a bryophyllum, an Hawaiian succulent of special interest because of the "baby plant" rosettes that grow around its leaves, was awarded by Director Frits W. Went to three children, (left to right) Marsha Hagen, daughter of Mr. and Mrs. Hubert D. Hagen; Elizabeth Davidson, 9, daughter of Dr. and Mrs. Morris Davidson; and Cindy Watkins, 10, daughter of Mr. and Mrs. Thomas M. Watkins, for their spontaneous contribution to Shaw's Garden of money raised by "putting on a show" for and serving refreshments to neighbors. According to Mrs. Davidson, the girls "made up plays in which they acted, dressed up in a variety of funny clothes, and served lemonade and pretzels after the performance." Since Shaw's Garden was a favorite visiting place of the girls they decided to turn the profits over to the Garden and walked into the Friends of the Garden office recently with an envelope of bills and change.

Director and Mrs. Frits W. Went were caught by the photographers bidding a temporary farewell to St. Louis as they boarded a plane on August 14 for a six weeks trip to the Southwest Pacific area culminating in a collecting expedition into the mountains of recently opened areas of Australia and New Guinea. The Wents' first stop was Hawaii, where Dr. Went consulted on the possible establishment of a new tropical botanical garden. From there they went on to Sydney, Australia, where Dr. Went was a participant in a series of scientific meetings, and also took part in the dedication of a new phytotron at Canberra. For later phases of the trip, Dr. Went will spend two weeks in high altitude research and collecting in the mountains of Australian New Guinea. He hopes to return with some unusual specimens of the fantastic flora of this little known region, to add to the Garden's collection.

FEATHER GERANIUM — JERUSALEM OAK

THE curious, aromatic plant known variously as "Ambrosia," "Feather Geranium," or "Jerusalem Oak," has recently been grown in several St. Louis gardens and inquiries about it have come to the Garden from several sources. It is a species of Chenopodium, *C. botrys,* and as such is closely related to the common, weedy Lamb's Quarter or Smooth Pigweed. The entire plant is strongly (and mose agreeably) aromatic. It has deeply lobed basal leaves, something like those of a genanium or an oak (hence the two common names) from which rise long panicles of small flowers followed by attractive small seed pods. It is now grown as a curiosity or to use for its fragrance and dainty panicles in either fresh or dried flower arrangements.

Chenopodium botrys has had a long history of association with man and was grown in medieval gardens for its fragrance and its supposed medicinal qualities. It was "hung in bunches in the kitchen to sweeten the air" or used like lavender to give a fresh smell to bed linens. It is sometimes confused with the closely related vegetable, Good King Henry *(Chenopodium Bonus-Henricus)*, a lower and non-aromatic perennial, with spinach-like leaves and dense flower clusters, which since the middle ages has been grown in European gardens for use, like spinach, as a pot herb.

Chenopodium botrys is native to the Near East and to Africa and rather generally in central Eurasia. The name Jerusalem Oak may possibly refer to its having been brought back by the Crusaders or other visitors to the Near East. Its original home is a little hard to determine since it has the capacity of sowing itself spontaneously in places to which it has been carried, though it never becomes weedy and troublesome. There are specimens in the Garden's herbarium which were collected in St. Louis a century ago though so far as we know it has never become established here. Palmer and Steyermark, in their Flora of Missouri, list it as occasionally turning up in waste ground in St. Louis, Shannon, Ozark, Stone and Jackson counties. It has been collected at various places throughout the West including several remote mining camps and has become fairly common in parts of California.

It is one of those plants whose size varies a great deal with the fertility of the soil and the amount of water it has had to grow on. I have seen it coming up between the bricks in the pathways of an old New England garden near Worchester, Massachusetts, where in early summer it was only a few inches high. Its leaves there did remind one of a small oak-leaved geranium and a pleasant aroma arose when they were stepped on. At the other extreme were the big plumes of seeding panicles used by Mrs. Mary Baer in the attractive Victorian arrangement of dried flowers which was recently on display in Mr. Shaw's old country home, TOWER GROVE. These had been grown in the rich soil of an excellent garden in Ferguson and the branching panicles were well over two feet in length.

EDGAR ANDERSON

FALL COURSES

JUST as a reminder, here are some notes and dates on courses and children's classes previously announced for this fall:

Course 107—Bulbs, Indoor-Outdoor

Time: Tuesdays, October 2 and 9, 8:00 to 9:30 P. M.; Thursdays, October 4 and 11, 1:00 to 2:30 P. M.

Place: Experimental Greenhouse.

Fee: $8.00 for 2 meetings.

Instructors: Clarence Barbre and Kenneth Peck.

Instruction on bulb forcing and outdoor bulb culture will be given. The Garden will supply each student with 24 top quality bulbs in 7 inch clay pans which may be taken home. The Garden will also provide space for cool treatment which the forced bulbs require. This is a practical and timely course for October.

Course 104—How to Propagate from Cuttings

Time: Tuesdays, October 16 to November 13, 8:00 to 9:30 P. M.; Thursdays, October 18 to November 15, 1:00 to 2:30 P. M.

Place: Experimental Greenhouse.

Fee: $12.00 for 5 sessions.

Instructors: Clarence Barbre and Kenneth Peck.

Fundamental facts and procedures of producing trees, shrubs and perennials from cuttings (asexual reproduction). The Garden will supply a plastic covered metal propagating flat, media and plant materials for 40 to 50 kinds of plants.

Student practice will emphasize propagation of house plants, such as begonias, dieffenbachias, philodendrons, etc. Some attention will also be given to hardwood cuttings. The following methods of vegetative propagation will be used: root cuttings, suckers, divisions, hard and softwood stem cuttings, leaf, bud and scale cuttings.

Saturday Morning Natural Science Programs for Children

Time: 10:00 to 11:30.

Place: Shaw's Garden — Museum Building.

September 8—Nature Walk—"Fall Flowers."

September 15 — Natural Science Study—"Dangerous and useful mushrooms and fungi."

September 22 — Natural Science Study—"Lichens, plants with 'split personalities'."

September 29 — Nature Study — "Observe seed and fruit formation through microscope."

Saturday morning programs are free to all children, ages 7 to 16. No previous registration is necessary.

* * *

BOOK REVIEWS

Leonid Enari. ***Ornamental Shrubs of California.*** pp. 114. Ward Ritchie Press, Los Angeles 27. (1932 Hyperion Ave.) 1962. $5.95.

DR. ENARI is on the staff of the Los Angeles State and County Arboretum and has had experience in meeting the needs of those "students, teachers, nurserymen, gardeners, landscape architects, home owners, and amateur botanists who often find the standard manuals of plant identification too technical for use." He presents a forty-three page key to 277 of the ornamental shrubs of California, be they native or introduced from various other parts of the world. The key requires flowers and leaves but is a comparatively simple one. After trying it out on half a dozen California ornamentals of my acquaintance I decided that an intelligent amateur would find it helpful, provided of course that his unknown plant had been included in the 277 species selected by Dr. Enari.

The bulk of the book is given over to clear descriptions of each of the species in technical, but relatively simple, terms. Black and white diagrams by the author illustrate the commonest of the technical terms and crude but effective leaf outlines (with details of veination) are given for over a hundred of the species. Interesting and useful notes are appended to a number of the descriptions, particularly for those which are known to be dangerously poisonous. The entry for Japanese Quince will serve as an example:

JAPANESE QUINCE. *Chaenomeles speciosa* (Sweet) Nakai. *C. japonica* Hort., *C. lagenaria* Koidz., *Cydonia japonica* Loisel.

A deciduous shrub up to 10 ft. Leaves simple, ovate to oblong, evenly and sharply toothed, 1½ to 3½ in. long, alternate, short-petioled, glabrous, dark glossy green above, paler beneath, with conspicuous large kidney-shaped toothed stipules (Fig. 86, 87). Flowers scarlet-red (in the typical form), 1½ to 2 in. across, regular, bisexual, nearly or quite sessile, in 2's, 3's, or 4's, produced on the old wood. #Calyx of 5 united sepals, 5-lobed. #Corolla of 5 distinct petals. #Stamens numerous. #Pistils 1. #Fruit fleshy, a pome, apple- or pear-shaped, 1 to 2½ in. across, greenish-yellow, with small dots, very hard, sometimes used for preserves. #Native to China and Japan. Runs into many forms with white, rose, pink, scarlet or crimson, single, semi-double or double flowers.

E. ANDERSON

Cledwyn Hughes. ***Making an Orchard.*** pp. 120. St. Martin's Press, N. Y. 1962. $3.50.

CLIMATES, varieties of fruit, and readily available sprays differ so widely between England and America that this charming little book will be of little direct practical help to the St. Louis orchardist. However, for the numerous Americans who like to read long novels of English country life considerable portions of the text will serve as an acceptable substitute. Take for instance Mr. Cledwyn Hughes' description of an English dessert apple, the Beauty of Bath: "After Irish Peach, Beauty of Bath is one of the earliest of the dessert apples and comes to the table early in August. It is a red-and-green apple and looks very attractive and handsome on the tree in midsummer sunshine. The first bite is sharp and tangy, and often some of the redness of the skin reaches down into the flesh in an appetizing manner. The tree is a sturdy creation, strong-limbed and safe to the ladder. . . . This is a dessert apple and one of the favourites of the English orchard. Beauty of Bath is an apple which is metallic yellow, a yellow which has the quality of silver coinage about it; and on this are crimson stripes. Altogether the effect is handsome. The flesh of this choice eating apple is tender and succulent, juicy and moist, and of a most pleasing flavour if the fruit has been picked when really ripe. One of the advantages of Beauty of Bath is that the fruit ripens over a period and can be picked from the tree on many occasions. It was first introduced by Cooling in the 1860s."

E. Anderson

Roy Genders. ***Miniature Chrysanthemums and Koreans.*** pp. 100–viii. St. Martin's Press, N. Y. 1961. $4.50.

This American edition of a recent English book will be of interest to American gardeners who specialize in Chrysanthemums. Length of day, temperature and rainfall, and available horticultural products vary so widely between the two countries that the detailed horticultural directions will be worse than useless to the average American amateur gardener. It calls attention however to the dwarf Lilliput varieties, the *dwarf cushion* Koreans and the new dwarf pompoms which are practically unknown in this country. Their characteristics and various details of their culture are illustrated in 22 excellent black and white photo-engravings and 12 vivid color plates.

E. Anderson

D. Gourlay Thomas. ***Simple Practical Hybridizing for Beginners.*** pp. 127. St. Martin's Press, N. Y. 1962. $3.95.

In a chatty, easy-going style Mr. Thomas gives simple directions and details homely advice to the would-be hybridizer of gladiolus, sweet peas, daffodils, roses, chysanthemums, and carnations. With the help of simple diagrams he shows exactly how to prepare the flowers for making crosses. He discusses from the viewpoint of the trade, hybridizing which has been done with these species in the last few decades and makes specific suggestions as to the kinds of crosses which might lead to further advances. Though he has had some American experience, most of his life has been spent in England and much of his detailed advice will be more helpful for English than for American gardeners.

There is at least one minor error in the book. In his exhortation to the amateur to go ahead on his own, Gourlay Thomas makes the statement (p. 29) that "Gregor Mendel knew little botany himself until he started his experiments." Actually he was sent to the university by his Order and there concentrated on both biology and mathematics. His earliest (and little known) papers refer to interests started during his student days and deal with pests of garden peas.

E. Anderson

FRIENDS OF THE GARDEN NOTES

An event of unusal interest is the first annual Friends of the Garden Picnic, planned for Sunday afternoon, September 23, at the Arboretum at Gray Summit, Missouri. Invitations to the picnic went out to all Friends early in September, urging them to plan an old fashioned family outing on the beautiful 1600-acre Arboretum grounds, and offering boating, fishing, horseshoe pitching and other traditional picnic sports, as well as a variety of nature walks and informal classes led by members of the Garden staff. Activities have been planned for both adults and children, with the intention of providing plenty to do for everyone, but also keeping in mind that many Friends may want to spend their afternoon in quiet, unorganized strolling or just plain sitting under a shady tree and enjoying the peace and quiet. Woods, fields, streams, lakes—all are there, waiting for your enjoyment. It is expected that many Friends will want to bring their own family picnics, or combine with other families for the outing, but it has been arranged that box lunches (including fried chicken) may be bought at the Arboretum if reserved in advance. Be sure to indicate on the return postcard sent with the invitation if you want box lunches. Similarly, while many Friends may enjoy the rather pleasant drive of an hour or less to the Arboretum, free bus rides will also be offered. See the invitation for details. The hard-working planning committee under the chairmanship of Mrs. Curtis Ford hopes that it has thought of everything to make this Friends picnic a memorable occasion for the whole family. Now all we need is perfect early autumn weather—and Friends.

IMPORTANT NOTE: Fishing and picnicking ordinarily are *NOT PERMITTED* at the Arboretum. They are being offered on this one occasion *ONLY*, as a special benefit to Friends of the Garden. We trust this unusual privilege will not be abused in the future.

Early fall woodland scene at the Arboretum is an example of attractions that await the enjoyment of those who attend the Friends of the Garden picnic on Sunday afternoon, September 23.

PHOTO: P. A. KOHL

Response to the appeal (mailed along with the June BULLETIN) for help with a "telephone party" in January has so far been encouraging. Co-chairmen for Membership, Mrs. M. M. Jenks and Mrs. C. C. Johnson Spink, need all the help they can get for this important undertaking, through which they hope to add a significant number of new members to the Friends. As their appeal said, they will supply the lists and a convenient, cozy place to make the calls, volunteers supply the charm and the voice, and the Garden reaps the benefit. Many different approaches to increasing membership have been tried in the past, with varying success. This latest plan, for an intensive period of telephoning a selected list, combined with a thoughtfully planned follow-up, seems to offer many advantages. Its success hinges upon recruiting a large number of telephoners. Each caller will only have a few calls to make if enough callers will volunteer. Many voices make light work—but lots of noise!

◆

The course in classical Japanese flower arranging conducted last spring by Mrs. Dan Sakahara was, as reported earlier, a great success. Registration for the course was over-subscribed, and arrangements have now been completed to repeat the course "by popular demand." While registration is again necessarily limited (Mrs. Sakahara's personal teaching methods do not permit large classes), and priority is given to these people who have already registered, there are still some openings (particularly for the afternoon class) available on a first come, first served basis. Actually, two sessions of each of the eight classes in the course will be held, giving students a choice of either morning or afternoon sessions. Both sessions will be on Tuesdays, from September 18 through November 6. Morning classes start at 10:00 A. M., afternoon classes at 1:00 P. M. All flower and plant material is included in the fee of $15 for Friends ($18 for non-Friends), but you should be sure to bring the following equipment with you: note pad and pencil; clippers or shears; eight-inch glass or metal pie plate as a container.

◆

Last February the Garden's Orchid Department found itself with a quantity of surplus plants of several varieties. It was decided to distribute these to Friends at a nominal cost and accordingly a sale was held at the Garden. Response was so great that over one hundred plants were distributed, and even after ransacking the greenhouses for additional plants which could be spared, we still ended up with a list of seventy names of Friends who had been disappointed. This announcement is good news for them. The Orchid Department now has a sufficient supply of duplicate and surplus plants to make one available to each of the seventy patient Friends whose names appear below. These plants are all purple bi-foliate cattleyas in good condition. Terms of the distribution are the same as applied in February, namely all sales are final and "as is," all are for cash at $2.50 per plant, and the buyer must come to the Garden to pick up the plant. If your name appears on the list below, please come to the Friends office at the Main Gate on Thursday, October 4, between 9:00 A. M. and 5:00 P. M. No plants can be reserved by telephone. If you do not want your plant, please call Kay Miller at the Friends office.

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Mrs. L. A. Nylins
Mrs. Bertha Burton
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Mrs. L. C. Martin
Dr. and Mrs. George Gantner
Mr. Ralph Astorian
Miss Gertrude Allen
Mr. G. F. Newhard
Mr. and Mrs. James W. Bernthal
Richard P. Jensen

* * *

To those who have enjoyed the authentic Indonesian delicacies served at the Garden, either at one of the special Indonesian dinners served to Friends last spring, or at the Rumahsahtay restaurant operating at the Garden since May, it will come as welcome news that arrangements have now been completed to accommodate special luncheon and dinner parties at the Rumahsahtay through the fall and winter months. Group parties have been arranged at the outdoor terrace during the summer, and many Friends have found this a charmingly different way to entertain, with the unique atmosphere and surroundings of the Garden combined with the excellent service and unusual food provided by Hank Falkenberg. Now a variety of enticing menus for both luncheon and dinner are available and groups of six or eight, and up to two or three hundred can be served. Reservations must be made in advance, and for larger parties dates must be chosen with care so as not to interfere with other Garden activities in the Floral Display House. For details of menus, prices and reservations, call Mr. Falkenberg at PR 3-9539 or write to him care of the Garden. For special occasions, he can arrange to bring the food to you at home.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 10:00 P. M. Tower Grove House is open daily from 9:00 A.M. to 5:00 P.M. (April through November); 10:00 A.M. to 4:00 P.M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year other shows, competitions and festivals are sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

October [illegible]
Volume [illegible]
Number [illegible]

COVER: The pretty flower is not a flower at all, but rather a seed pod of the Chinese Parasol Tree, *Firmiana simplex*. This subtropical tree, also known as Phoenix Tree, has been growing outside at the Garden for many years but before this summer had never produced seeds. It is not supposed to be winter hardy as far north as St. Louis, but George H. Pring set it outside anyway 30 years ago and finally his patience has been rewarded with a tree full of these characteristic parasols. Last year the tree bloomed but was not strong enough to produce seeds; this year's fruiting is farther north than any record known, according to Dr. Anderson. PHOTO BY THOMAS M. MORTON

CONTENTS

The Subtropical Gardens at Tresco Abbey
Tulips
First Monday Lecture
Picture Story—Friends of the Garden Picnic
Children's Summer Programs 1962
Book Review
Friends of the Garden Notes
New Members of the Friends of the Garden

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: BRIAN GORDON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Volume L No. 8 October 1962

THE SUBTROPICAL GARDENS AT TRESCO ABBEY

CHRISTOPHER CHOWINS

From February 1961 until March 1962 I was in charge of the gardens at Tresco Abbey, Isles of Scilly, Cornwall, England. This unusual and beautiful collection of subtropical plants is the legacy of Augustus Smith, a bachelor and noted banker from the county of Herfordshire, who built the house and laid out gardens on Tresco Island in 1834.

The Scilly Isles are situated about 30 miles southwest of the mainland of England, a quick airplane hop or a pleasant three-hour sea trip from Penzance, in the County of Cornwall. The main island, St. Mary's, has the largest population and Tresco is the second largest of the five inhabited islands, with a population of about 180 people.

The main crops grown on the islands are early potatoes and daffodils, the latter being the most important. The daffodil harvest begins in December and continues for roughly two months until the last flowering variety is gathered.

Today the tourist industry plays a large part of the life of the islands and visitors who desire a quiet and restful holiday find what they want and return, often annually. There is a fine modern hotel on Tresco where a visitor may enjoy excellent hospitality and take many interesting excursions to local beauty spots and the neighboring islands. The gardens are one of the main attractions and are open to visitors every day except Sunday. A small admission fee is collected, the accumulation of which goes to maintain the extensive range of plant material grown.

I hope in this account of the gardens at Tresco Abbey to give a real impression of the gardens as a whole, more than a list of plants together with their descriptions.

It has been determined that at one time there were 3,500 distinct species and varieties growing here; to this figure both subtractions and additions have been made over the years. The present collection numbers between 2,000 and 2,500.

The biggest limiting factor to plant growth on the island is wind. Gales blow off the Atlantic from the southwest and northwest and often attain tremendous velocities. Between 1929 and 1930 the wind rose to over 80 miles per hour on no less than 14 occasions. In 1961 the wind reached a force of almost 100 miles per hour and I found to be outside during such a gale both a frightening and exhilarating experience. At night in our cottage in the gardens, the continual roaring of the wind made my wife and me thankful for having shelter.

These fierce gales, which occur at

regular intervals, limit successful plant growth. The main source of damage is the breaking down of the sheltering trees which protect the more choice plants. Also the continual onslaught of salt-laden lesser winds proves most damaging to tender evergreen material everywhere.

To this leveling wind is no doubt due the singularly bleak aspect the low, little island first presented Smith, for there was nothing growing taller than a gorse bush on it, save in the old vicarage garden, where there were some typical English garden plantings.

Offsetting the menace of wind, the factors favorable to the exuberant growth of so many diverse plants are temperature, rainfall, and sunshine. The temperature, affected by the kindly influence of the Gulf Stream, has a yearly average of between 40° and 60° F; frost is seldom if ever experienced, even in its milder forms From my daily observations of weather details, I noted very little difference between night and day temperatures. The average yearly rainfall is between 30 and 32 inches. Most of this rain is accompanied by wind, so my staff and I were seldom forced inside during rain and could always work comfortably somewhere in the garden beneath the shelter of the big trees. The number of hours of sunshine on the island is among the highest in the British Isles. The soil is light, a mixture of sand and peat with outcrops of granite, and below is often found a subsoil of almost pure sand, and then rock. The soil is hot and dry in the summer and so is particularly suitable for the South African flora.

The seasons involve only gradual and slight changes in temperature. The rainfall is well distributed throughout the year, and there is always plenty of sunshine. These conditions are as ideal as possible in the temperate latitudes for subtropical flora. This flora is planted thickly and thrives, the effect being similar to that of a greenhouse where plants are grouped closely in naturalistic settings. In reference to this effect, Tresco Abbey Gardens have been accurately described as "Kew Gardens with the lid off." I was truly amazed at just how many tender and unusual plants could be grown outside with the aid of some ingenuity and much enthusiasm.

When Augustus Smith built his gardens and home here, he laid down a pattern of architecture and husbandry which has been upheld closely through the three following generations. Smith was mainly interested to see the beautiful and more unusual plants in his garden, plants which would not grow on the mainland because of limiting climatic factors. It was soon realized that shelter for all the tender and semi-tender plants would be of primary importance. The trees which gave shelter have always been *Cupressus macrocarpa*, *Quercus ilex*, and *Pinus radiata*. At Tresco, *Cupressus macrocarpa* grows much larger than any on the British mainland that I have observed, reaching a height of about 80 feet. To insure the best habit as windbreaks, the *Quercus ilex* are regularly either cut back or trimmed, and there are some magnificent hedges up to 70 feet tall in the gardens serving not only as windbreaks but also as very attractive architectural features. In 1896 after a particularly violent storm, the Monterey Pine, *Pinus radiata,* was first noted as being able to resist high velocity winds and since then many of these trees have been planted to create and renew shelter belts.

Later it was discovered that, once established, the most attractive evergreen *Rata* from New Zealand, *Metrosideros tomentosa,* was particularly wind and salt resistant and it now serves as a most beneficial buffet to high winds. In one particular area these trees are planted in a rough line and reach a height of 100 feet; in June and July hundreds of brilliant red flowers adorn the huge trees and are a truly magnificent sight. These "Red Trees" are planted all over the garden and I am told there has never been a mature specimen uprooted by the fiercest gale.

Throughout the garden there are little hedges which serve no apparent architectural purpose, but are essential for the protection of the really tender plant material from damaging underdrafts sweeping in at low levels. All these hedges have some merit, whether because of attractive flowers, foliage, or both. *Pittosporum* hedges are widely used, as they are elsewhere in the county of Cornwall, and *P. tenuifolium* is much valued for its cut foliage. Besides this species there are at least nine others in the gardens, including the large flowered *P. tobira* from China and *P. crassifolium* from New Zealand, with its chocolate flowers and shiny black seeds.

Olearia traversii makes a reasonably quick hedge but does tend to grow a little bare at the base. *Escallonia macrantha* is much used and there are several varieties of this which are said to be better than the type; these include, for example Red Guard and Crimson Spire. As a specimen shrub the variety of *Escallonia* called "C. F. Ball" is my particular favorite for its particularly good red flower color. Before leaving the *Escallonias,* I should mention the insignificant flowers of *E. viscosa,* which at a distance of about five yards have a most pungent odor reminiscent of pig oil.

Veronicas are a lovely shrub anywhere, I believe, whether as hedges or specimens. Most used on this island is *V. macrantha,* which makes a reliable hedge in most situations. *Veronica speciosa* var. *beadfortii* is a particularly fine dark purple; the November-to-February flowering *V. lewisii* with its two-toned flower color of white and pale purple is worthy of inclusion in any garden where it may thrive.

To understand the plan of the gardens one should try to form a mental picture of the windbelts of tall trees surrounding them the many hedges of varying lengths running at different strategic angles, which together with the sheltering walls of Cornish stone and the plenteous use of local stone for rock work provide a skeleton for the organization of plants in an informal manner with an emphasis on abundance, which lends a slightly jungle-like atmosphere to the gardens.

The gardens maintained consist of approximately 12 acres on the southern slope of the central hill of the island. Broadly speaking they are divided into three main sections, known as the top terrace, middle terrace, and long walk. The top terrace is naturally at the top of the garden and runs east and west for about 300 yards. The long walk runs parallel to the top terrace on level ground towards the bottom of the garden. The middle terrace is a shorter walk between the other two. There are various paths connecting these main walks.

The main way down from the top of the garden to the bottom, about 150 yards, is by a series of steps running from the sculptured stone head of Father Neptune down to an old iron brazier taken from a lighthouse which once existed on a neighboring island.

Standing at the eastern end of the top terrace one can enjoy a good overall picture of the gardens and the sparkling blue Atlantic beyond, with its snowy white breakers splashing against the isolated rock outgrowths.

There are many New Zealand cabbage trees *(Cordyline australis)* which are perhaps overplanted to some extent. The other species grown here do not seem to thrive like this type, though they are of considerable interest, as for example, *Cordyline indivisa*, *C. stricta*, and *C. australis aureo-striata*. The leaves of *C. australis* severed at just the correct stage of development are much used to tie stakes, and have the advantage of not cutting into the bark of a supported tree as string often does; the leaves of *Phormium tenax* (New Zealand flax) may be also used in a similar manner.

One of the outstanding features of this unique garden is the planting of many individuals of one genus in groups small and large and flowering at approximately the same time. To the casual visitor the masses of blue flowers of *Agapanthus orientalis* and the white of *A. orientalis alba* are one of the most evident features. They flower well annually and seem to grow almost anywhere without the slightest trouble. The deciduous *A. campanulatus* is represented by one very dark, almost navy blue form. There are only a few clumps of the *A. orientalis monstrosus* growing with its flower a full nine inches across. The very dwarf *A. americanus* is most suitable for rock work and increases itself quite rapidly.

Without noting any subject in particular and by concentrating on the color green, one can enjoy a most beautiful and interesting landscape. This fact was pointed out to me by the present owner of the island and my employer, Lieutenant Commander T. M. Dallier Smith. The considerable variations of this one color, whether on a dull or sunny day, with the Atlantic Ocean in the distance, is a sight of which I never tired and which I retain still as a most pleasant memory.

I will isolate while still at my favorite vantage point the trees which really stand out to the eye; the *Metrosideros tomentosa*, unpruned and untrained, maintaining their excellent natural shape and the huge *Quercus ilex* hedges up to 70 feet tall and as much as 20 feet across at the top are the most impressive. The latter did look good after their annual expert trimming, and though I did regret that no really quick method could be devised for this job, I was thankful for the polished work of the two men who labored so hard at this.

The subtropical effect is realized most typically by the fine specimens of palms in the gardens. Outstanding among these, also the largest and most planted, are *Phoenix canariensis*, *Trachycarpus fortunei* and *Chamaerops humilis* are much in evidence together with the more rare *Jubaea spectabilis*, *Cocos campestris* and *Livistona australis*. The "Nikau palm" *(Areca sapida)* attracts much attention from visitors when the large waterproof leaf sheaths fall to the ground to expose the bunch of pink rods of flowers.

On a sunny day in the spring and early summer, the South African *Mesembryanthemums* are a joy to behold, cascading down over the rock faces with almost the whole of the total surface area studded with their dainty flowers. Although these have been divided into several distinct genera, I am afraid that I still consider them overall as *Mesembryanthemums*. Among my personal favorites are the comparatively large orange flowered *Lampranthus aurantiacum*, *Drosanthemum framesii*, and the three forms of *Lampranthus blandus*, pink, white, and red. Perhaps one of the most appealing in precise and symmetrical flower form is *Lampranthus brownii*. The fast growing *Oscularia deltoides* may be seen, together with *Mesembryanthemum edulis*, growing naturalized all over the island. I raised cuttings of these annually, since some suffered during the winter from dampness. The real winter flowering species is the dark purple *Lampranthus zeyheri*.

The *Pelargoniums*, mostly from South Africa, grow at Tresco as rampant shrubs and are planted in large quantities. The scented leaved species and varieties really do give a characteristic fragrance to the whole garden. Among my favorites of the true species are *Pelargonium crispum*, *P. denticulatum*, and *P. cucculatum*; the rather slower growing *P. violareum*, with its three distinct flower colors and dainty small leaves, is most attractive though not easily propagated, in my experience. The *Regals* are undoubtedly represented in the largest numbers and are really most vigorous in their growth, needing at times considerable pruning. Some of the best of these *Regals* are "Blytheswood," "Royal George," and "Black Prince," also "Moore's Victory," "Pretty Polly" and "Monsieur Norin." There is no trouble in raising the majority of these *Pelargoniums*, since cuttings may be rooted successfully at almost any time of the year in the location they are desired to grow.

Cinerarias (Senecio cruentes) grow really well here and seed themselves abundantly; the resultant mature specimens are as handsome as, and the flowers can be compared favorably with, the pot-grown greenhouse plant. The color variations are excellent.

There are several different and delightful forms of *Amaryllis belladonna* flowering towards the end of summer. These have been widely planted in the gardens, even along path edges where they prove quite happy and free-flowering. Another late summer flowering feature are the *Watsonias* from South Africa, the seed heads of which are greatly prized by the flower arranger. *Watsonia marginata*, *W. gal-*

pinii and also *W. filifera* are represented together with several hybrids.

I must digress here to say a word about the many things in the gardens which have been found to be most valuable in the popular art of floral arrangement. Dried seed heads from the exotic subjects are much in demand. Seed heads of *Aeonium, Wackendorfia,* and *Agapanthus* are most popular. For green foliage, the choice is wide and includes *Corynocarpus laevigata, Coprosma baueri, Myrsine africana, Myrtus bullata, Oleari Forsteri.* On Tresco, as in many parts of western England, deciduous trees bearing lichen are quite common and a selection of lichenous twigs helps greatly to give an oriental effect in floral arrangements.

The South African *Echiums* are well liked and are planted literally everywhere by design and by self seeding. The biennial *Echium pinnatum* forms huge blue flowering spikes up to thirty feet tall and seeds itself abundantly. There are three shrubby species in the gardens with their different shades of this particularly fine blue. From the Canary Isles are *E. calithyrsum* and *E. fastuosum*, the former, which bears the typical red stamens, being the true species. There is a hybrid between these two species known as *E. scilloniensis.*

Together with the palms, the *Aeoniums*, I think, help most to give the subtropical effect. These are planted everywhere near rock work, and grow on and around the rocks and also on paths and even the roofs of buildings. They seem to exist on nothing but humus from the annual die-back of some of the leaves. There are about thirty species of *Aeoniums* at Tresco, mostly from the Canary Isles. My personal favorite is the quaint *A. tabulaeforme*, its form being nearly perfect though its flowers are insignificant. But *A. cuneatum* provides a regular source of excellent yellow flower trusses.

Concerning the succulents, of which there are many, I can isolate four which I consider outstanding. The huge, sharp-pointed *Agaves*, i.e., *A. americana* and *A. offoyana* from Havana, take many years before flowering, after which they die. These *Agaves*, however do produce suckers and provided these are severed from the parent plant before flowering, the plant continues its life in much the same position.

The specimens of *Furcraea longaeva* with their huge leaves and immense spikes of creamy white flowers are a wonderful sight. In 1944 there were as many as fifty-seven in flower, the tallest being forty feet. In 1962 many of these were in flower and impressed Queen Elizabeth, the Queen Mother, a keen and knowledgeable gardener, when she visited the gardens for the day.

There have been some sixty species of *Aloe* in these gardens: Of these I can mention the deep red *A. arborescens*, flowering during winter, and also the delicate *A. ciliaris* from the Cape Province. *A. striata* from the southern Mediterranean area grows very well and soon covers a large patch of ground. The coloring in the foliage of *A. mitriformis* together with the delicate, warty outgrowths make this a striking plant.

The most remarkable color of any flower in the gardens, in my opinion, is of that strange bromeliad, the *Puya.* I had the luck to see the lovely gun metal blue-green of *Puya caerluea* in 1961, the first time this species had thrown a flower spike in ten years. Also from Chile is *P. chiloensis* with its much larger yellowish flower trusses and very sharp spines, to which I can personally attest!

Finally I would like to mention, at random, some of the less important subjects which I found to be of interest and beauty.

The genus *Correas* is one of great merit, from the tough, fast-growing *C. virens*, which is most useful for low windbreaks and cut foliage, to the terribly slow-growing but very lovely *C. cardinales* from New South Wales (Australia). *C. cardinales* is a plant which defies the propagator's skill—scarcely making any growth at all, but remaining covered with its deep red bells of flowers. All artificial attempts at increase fail and it does not set viable seed. I did manage successfully to approach graft two precious twigs onto a stock of *C. virens*, and when I left, both these were thriving, though not yet severed. I believe the only other specimen in England exists at Kew Gardens.

On a very dry bank containing poor soil, at the top of the garden, grow and thrive some of the South African *Proteas, P. incompta, P. latifolia*, and *P. longifolia.* All do amazingly well, and at almost any time of the year a flower can be seen on one of these species.

I am glad to have seen the largest of the honeysuckles in cultivation, *Lonicera hildebrandiania* from Thailand, but I do not think it a plant of great merit, despite its enormous flowers and six-foot leaves. Two lovely "Blue Trees" from South Africa which I enjoyed very much were *Podalyria calptrata* and *Psoralea affinis.* The former flowers as early as January, while the latter is seen in summer with a deeper shade of violet. Both these fine legumes are very tender.

I don't believe there could be many trees in the *Scrophulariaceae*, though the two I note are worthy of interest botanically as well as being most ornamental: *Bouckeria gerrerdiana* with its sticky leaves and typical "snapdragon" flowers is from Natal, and *Paulonia tomentosa* is an outstanding purple-flowered tree from China.

It may be of interest to mention plants in the gardens which are so prolific in growth as to be considered necessary to remove as weeds or keep severely curtailed. *Muelenbeckia complexa* from New Zealand is troublesome, and has even established itself on the sand banks of some of the beaches, while *Senecio mekanoides* becomes quite a nuisance among the rock gardens. *Helychrysum petiolatum* will soon smother a shrub if allowed too much freedom. The seedlings of *Myrtus luma* have to be regularly hoed; the specimen trees of this, of course, have a fine bark color of light brown. Although it is so free growing, I am glad to say that the sweetly scented *Freesia refracta* is not curtailed to any extent.

There are many more interesting

plants growing in the gardens at Tresco and although I hoped not to make this article a mere catalogue of names I fear it is fast becoming one. How difficult it is to describe a flower by means of words, save botanically. I hope to have at least expressed some idea of the diversity of the plant material, the general sense of a lush and varied growth of vegetation, and the picturesque, exotic beauty of these unusual gardens. I would sincerely recommend to any interested visitor a tour of the Tresco Abbey Gardens and of all the Islands in general. The complete peace and incomparably beautiful surroundings will, I am sure, make the same happy and lasting impression which they have made on my wife and me.

Christopher Chowins, 36, joined the staff of Missouri Botanical Garden recently, as a horticulturist of tropical plants. He is an Englishman by birth, and received his training at the Royal Horticultural Society and as an exchange student with the Niagara Parks Commission School of Horticulture, where he later served on the faculty. Before his tenure as head gardener of the Tresco Abbey Gardens, he was superintendent of grounds and gardens at the Rank Organization Film Studios, Pinewood, England. He now lives in St. Louis with his wife and two children.

TULIPS

PAUL A. KOHL

OCTOBER is the best month in which to plant tulips. In November and December the weather conditions may be unfavorable or the soil so wet and cold that planting the bulbs becomes a miserable job instead of a pleasant garden experience. Under such conditions it is impossible to plant bulbs properly and therefore they will not do as well as when planted in October.

Darwin tulips, which have been popular for many years, are available in many colors and shades. They are the tulips with which most gardeners are familiar and are obtainable in seed stores, garden centers, nurseries and department stores. However, anyone wanting to create a fine spring garden of tulips will find about twenty different kinds, in several hundred varieties, listed in bulb catalogs. There are tall and short ones, singles and doubles, peony-flowered and bouquet or branch flowering, parrot and fringed, cottage and lily-flowered, Mendel and Triumph, Breeder and Rembrandt and a number of interesting species tulips.

One of the most brilliant large flowered tulips is Red Emperor, a Fosteriana tulip which blooms in mid-April. These Fosteriana tulips have been crossed with Darwin tulips and are listed as new Darwin hybrid tulips. General Eisenhower, a brilliant scarlet, is one of these which has done exceptionally well with us not only in its first year but in the two succeeding years, although the bulbs have not been lifted since they were planted in the fall of 1959. Apeldoorn and Holland's Glory, fine red and scarlet tulips, also belong to this new hybrid group.

Whether tulip bulbs should be left in the ground after they have bloomed, or lifted and replanted in the fall, is a question which cannot be given a direct answer. Tulip bulbs will deteriorate in a wet location but will live on for a number of years in soil that dries quickly after rains. Tulips that are left in one location should be planted at least eight inches deep and the foliage must not be removed in the spring until it has turned yellow, usually about June. Most annuals have shallow roots and may be planted between the tulips after they have bloomed. Sweet alyssum, dwarf marigolds, verbenas and vincas are some of these.

People who have grown tulips for a number of years know what to expect from the bulbs they buy. Those who have never planted bulbs may easily be misled by the advertisements in newspapers and magazines which offer tulip bulbs and 'bulblets" for about a penny apiece with a "money back guarantee" if not satisfied. There is a catch to these ads, hidden in the fine print which most amateur gardeners do not read. Most of the bulbs offered are non-blooming bulblets which under optimum conditions of soil and climate may develop into blooming-size bulbs in a few years, if they do not rot in the soil first. Good, blooming size tulip bulbs will cost ten cents or more apiece, but are a better investment.

Any tulip bulb will grow better if the soil is prepared before planting time. Bonemeal or superphosphate may be applied to the areas to be planted and worked in with spade and rake or power tiller. Groups of six or more bulbs of the same color are very effective together and endless combinations can be created with varieties of tulips and forget-me-nots, violas, pansies, creeping phlox and other perennials as background plants.

The choice of tulips is a matter of preference. Bulb catalogs list several hundred varieties and give the height, color and blooming time of each variety. In stores selections may be made from pictures and descriptions which are usually posted with every variety. A few recommended Darwin tulips and their colors are: Afterglow (apricot-orange), Aristocrat (violet rose), Bartigon (red), Golden Age (deep yellow), La Tulipe Noire (dark violet—almost black), Niphetos (yellow), Princess Elizabeth (pink), Smiling Queen (pink), and Zwanenburg (white).

* * *

FIRST MONDAY LECTURE

LADISLAUS CUTAK, Greenhouse Superintendent, and Calaway Dodson, Curator of Living Plants, will present an illustrated lecture on "Plant Hunting in Costa Rica" at 8 P. M. Monday, November 5, in the Museum of Shaw's Garden, Tower Grove and Cleveland Avenues. This program, the only First Monday Lecture scheduled for fall and winter, is open to the public without charge. Coffee will be served at 7:30 and there will be opportunity to ask questions after the program.

FRIENDS OF THE GARDEN PICNIC

The pictures on the next three pages were taken at the first annual Friends of the Garden Picnic Sunday, September 23, in the Arboretum at Gray Summit, Missouri. More than 1000 Friends came out for a pleasant afternoon of eating, boating, fishing, naturewalks, and general enjoyment of the 1600 acre Arboretum grounds. Even the fishing was good—that bass weighed 3 pounds.

CHILDREN'S SUMMER PROGRAMS 1962

KENNETH PECK

EACH year the Garden provides more activities for children in the St. Louis area. A new activity, the children's vegetable garden, was added this year and the Pitzman Summer Nature Program, given now for five consecutive years, has really increased in scope.

Last May, sixteen 8′ × 10′ vegetable garden plots were staked out for children. Fourteen of these plots were made into productive gardens through the industrious efforts of interested children and provided the rewards of well-spent effort, in the form of fresh vegetables. Children paid a $1 deposit and new garden tools were purchased, along with seed, fertilizer, and a tool shed.

Two children were assigned to each plot of ground and in addition to keeping the plot tidy and free of weeds they shared evenly the vegetables produced from their labor. Some idea of this garden's productivity may be had by looking at the weight of the harvest. Around 450 pounds of tomatoes (Burpee's Big Boy and Marglobe) were grown from 84 plants, a conservative average of 32 pounds of fruit per plot. Several plots produced over 40 pounds each. Peppers (Yolo Wonder), string beans (Romano, Top Crop bush, and Kentucky Wonder), lima beans (Henderson's Baby Wonder), onions, and winter radishes were also grown.

The Pitzman Nature Program enjoyed its most popular and productive summer. Its effectiveness is attributable to the many able and willing hands of the people who worked on the teaching staff. Pat McCue was back again along with newcomers Jerome Arter, a biology teacher, and Jim Wuenscher, a Washington University student. From the Assistants Council there were Marcia Eickmeier and Jean Bardenheier, who were students themselves in Pitzman Program only 3 years ago. And assisting the program both on and behind the scenes were Fred Bardenheier and Stanley and Wesley Ulrich, who were busy preparing and sorting materials for each day's classes.

The St. Louis Audubon Society again provided an excellent class in bird study. During the first Pitzman session, children in this class built a battery operated bird identification board under the direction of Mrs. Kirkpatrick. A little light flashes when the operator correctly identifies one of the birds pictured on the board.

Other class activities involving the study of insects, trees, and other plants were taught by the Garden's staff. A new class, "Edible Wild Plants," was given by Jim Wuenscher. He included both plants native to Missouri and many of the Climatron's tropical plants.

Pitzman Research Teams were formed from among the older children, who worked three on a team under an instructor's supervision. Among the variety of subjects the groups investigated were: Vertical distribution of seeds and organisms in the soil, snail populations in an open field, the effects of environment on seed germination rates and percentages, the preparation of edible wild plants, weather measurement and analysis (with attempts at prediction), the identification and control of lawn weeds, the anatomy of fish and some dissection procedures, and land management for agriculture.

The end of the second session was highlighted by a treasure hunt. In both junior and senior divisions, prizes were given to teams scoring the most points on a very rigorous hunt involving the collection of numerous items, such as leaves, insects, fruits and seeds which the children had studied during the summer sessions.

An adult section of the Pitzman Program was given, on a trial basis, for parents who came with their children. Although very modestly attended, this phase of Pitzman was successful for a beginning attempt.

The total registration for the two sessions was over 500 and 333 certificates of achievement were awarded to children who had attended class regularly.

BOOK REVIEW

Carnations for Everyman, Montague C. Allwood, St. Martin's Press, New York, 1962. 120 pp. $3.95. 10 color plates, 48 black and white illustrations.

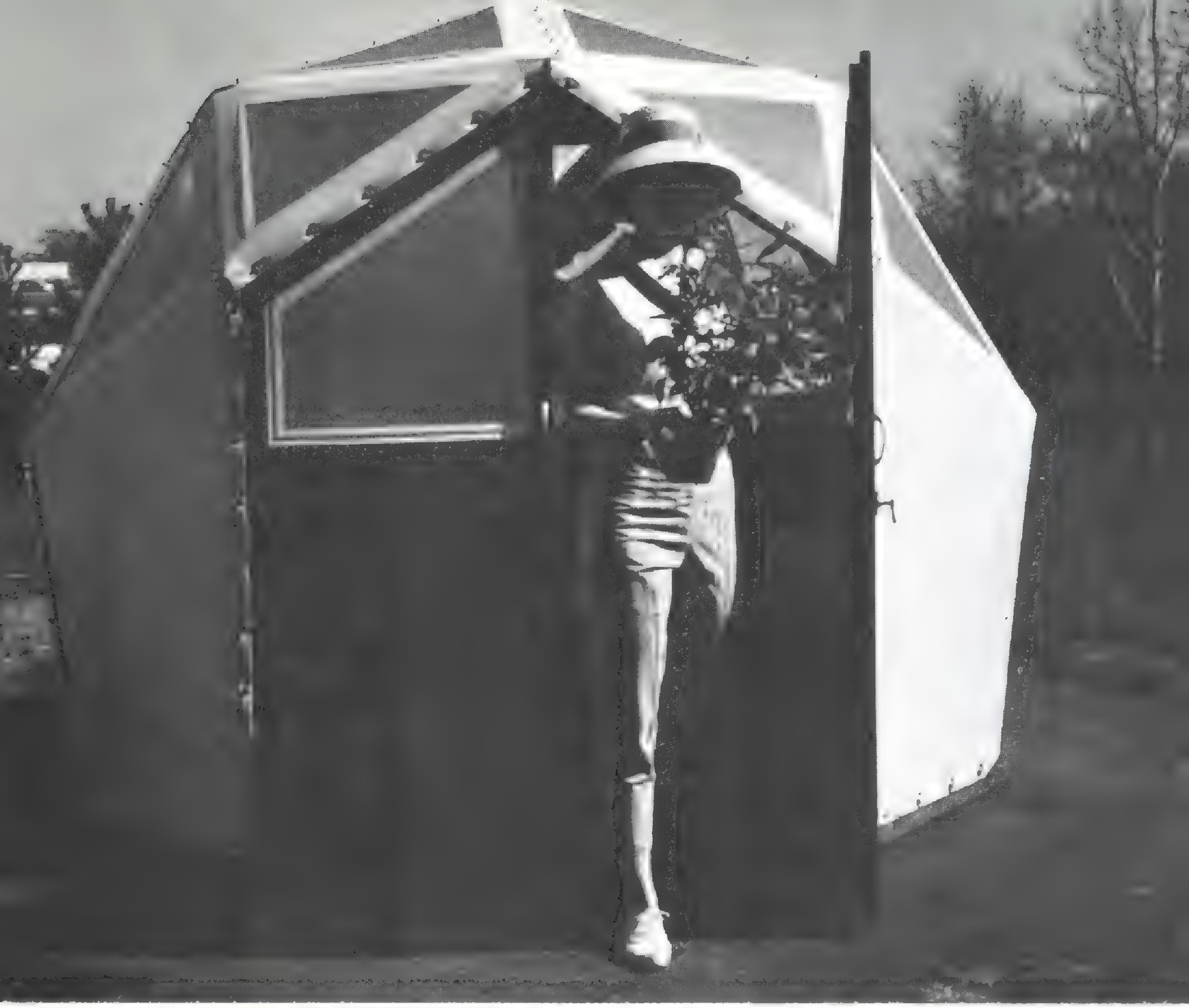
THIS book, *Carnations for Everyman*, was first published in England in 1931 and has since been reprinted or revised eight times. This is the first publication of the book in the United States.

Since most dianthus are native to the limestone mountains of southern Europe, it is only natural that they reach their best development in the climate of southern England. The book acquaints the reader with the types of dianthus grown in gardens and then follows with complete descriptions and cultural practices of the different kinds. Several chapters are devoted to the growing of perpetual flowering carnations in the greenhouse. The design of the greenhouse, ventilation, heating, planting, watering, supporting, fertilizing, stopping and disbudding are all discussed in detail. Propagation of dianthus by seed, cuttings and division are described and the clear black and white illustrations are helpful in emphasizing the difference between good and poor cuttings, properly potted plants, and when growths should be "stopped." That portion of the book which describes the raising of plants from seed takes up each kind of dianthus and gives the best time of the year to start the plants. There are also chapters on soil and composts, pests and diseases.

The discussion of commercial cut flower production and the calendar compiled for the south of England can be used only as guides and will need adjusting to adapt them to conditions in the United States. A chapter on the use of carnations and pinks as cut flowers has been added to this new edition.

The spicy fragrance and the long lasting qualities of pinks and carnations sould endear them to every gardener and this book should be a helpful guide in growing them.

PAUL A. KOHL



It will be some time before there are more full-sized Climatrons at the Garden, but already there are some unusual smaller dome greenhouses. These small "Geospace Gardenettes" share on a small scale the same geodesic dome principles as the Climatron, and are manufactured by Monsanto Chemical Co. in St. Louis. The Garden has been using several of the domes experimentally since last fall, at Monsanto's request.

The Gardenette, 9 feet in diameter and 6½ feet high at the top of its domed roof, encloses 300 cubic feet and has a floor area of 45 square feet. It is manufactured of plastic foam sheets which are shaped so that when they are fastened together correctly the dome is formed. Twenty triangular windows of translucent fiberglass reinforced plastic slope in many directions to take in direct sunlight at almost any time of day. The plastic foam walls are effective insulation for plants and in cool weather several light bulbs are the only heaters required, according to Garden tests. A small electric heater is sufficient to maintain growing temperatures during sub-zero weather.

Dr. Went has found the Gardenette is suitable for keeping display plants requiring cool temperatures and is also usable as a seedling house to start spring vegetables and flowers. Monsanto supplies the Gardenette in do-it-yourself kit form, including pre-fitted and glazed panels, base boards and blocks, pre-hung double doors, caulking, paint, fasteners and staking rods.

The Garden is continuing to use the domes for testing plant growth under varied lighting conditions. Colored glass has been installed in several domes in place of the normal plastic glazing so that Garden botanists and students may study the effects of colored light on plant growth.

FRIENDS OF THE GARDEN NOTES

DURING the months of October and November, Friends of the Garden can buy miniature size purple bifoliate cattleya orchids for $2.50 each. These orchids will be on sale in the Friends Office at the Main Gate every Wednesday from 9 to 5 beginning the second week in October. From 12 to 20 plants will be available each week as they come into bloom and one may be reserved by calling the Friends Office, TO 5-0440, on the preceding Tuesday. All sales will be final and Friends should present their membership card when picking up the orchids.

BEGINNING immediately and continuing until April, the Climatron will close an hour earlier on weekends. New hours are 9 A. M. to 9 P. M. Fridays, Saturdays and Sundays. Weekday hours and the daily hours for Tower Grove House remain 9 A. M. to 5 P. M.

RUMAHSAHTAY, the Indonesian snack bar located next to the Floral Display House, will not close this winter as originally planned, since a serving window has been opened into the Floral Display House. Winter visitors to flower shows and other exhibitions can now enjoy tasty Indonesian and American snacks along with the beauty of floral displays.

NEW MEMBERS OF THE FRIENDS OF THE GARDEN
MAY 11, 1962, THROUGH SEPTEMBER 27, 1962

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  Service, Inc.
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Mr. Frank C. Blumeyer
Mrs. Wm. Glasgow Bowling
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Mr. and Mrs. William L. Polk
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Hugh C. Cutler, Executive Director

Edgar Anderson, Curator of Useful Plants

Henry N. Andrews, Paleobotanist

Clarence Barbre, Instructor

Ernest Bibee, Horticulturist

Louis G. Brenner, Grounds Superintendent

Ladislaus Cutak, Greenhouse Superintendent

Carroll W. Dodge, Mycologist

Calaway H. Dodson, Taxonomist and Curator of Living Plants

Robert L. Dressler, Taxonomist and Editor of the Annals

James A. Duke, Assistant Curator of the Herbarium

John D. Dwyer, Research Associate

Waldo G. Fechner, Business Manager

Raymond Freeborg, Research Associate

Robert J. Gillespie, In Charge of Orchids

Brian Gordon, Editorial Assistant

James Hampton, Assistant Engineer

Paul A. Kohl, Floriculturist

C. Ranlet Lincoln, Assistant to the Director

Edith S. Mason, Landscape Architect

Viktor Muehlenbachs, Research Associate

Norton H. Nickerson, Morphologist

Lillian Overland, Research Assistant

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George H. Pring, Superintendent

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Kenneth A. Smith, Chief Engineer

Frank Steinberg, Superintendent of The Arboretum, Gray Summit

George B. Van Schaack, Librarian and Curator of Grasses

Trifon von Schrenk, Associate Curator of the Museum

Robert E. Woodson, Jr., Curator of the Herbarium

SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 9:00 P. M. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year other shows, competitions and festivals are sponsored by various Garden Clubs and Flower Societies.

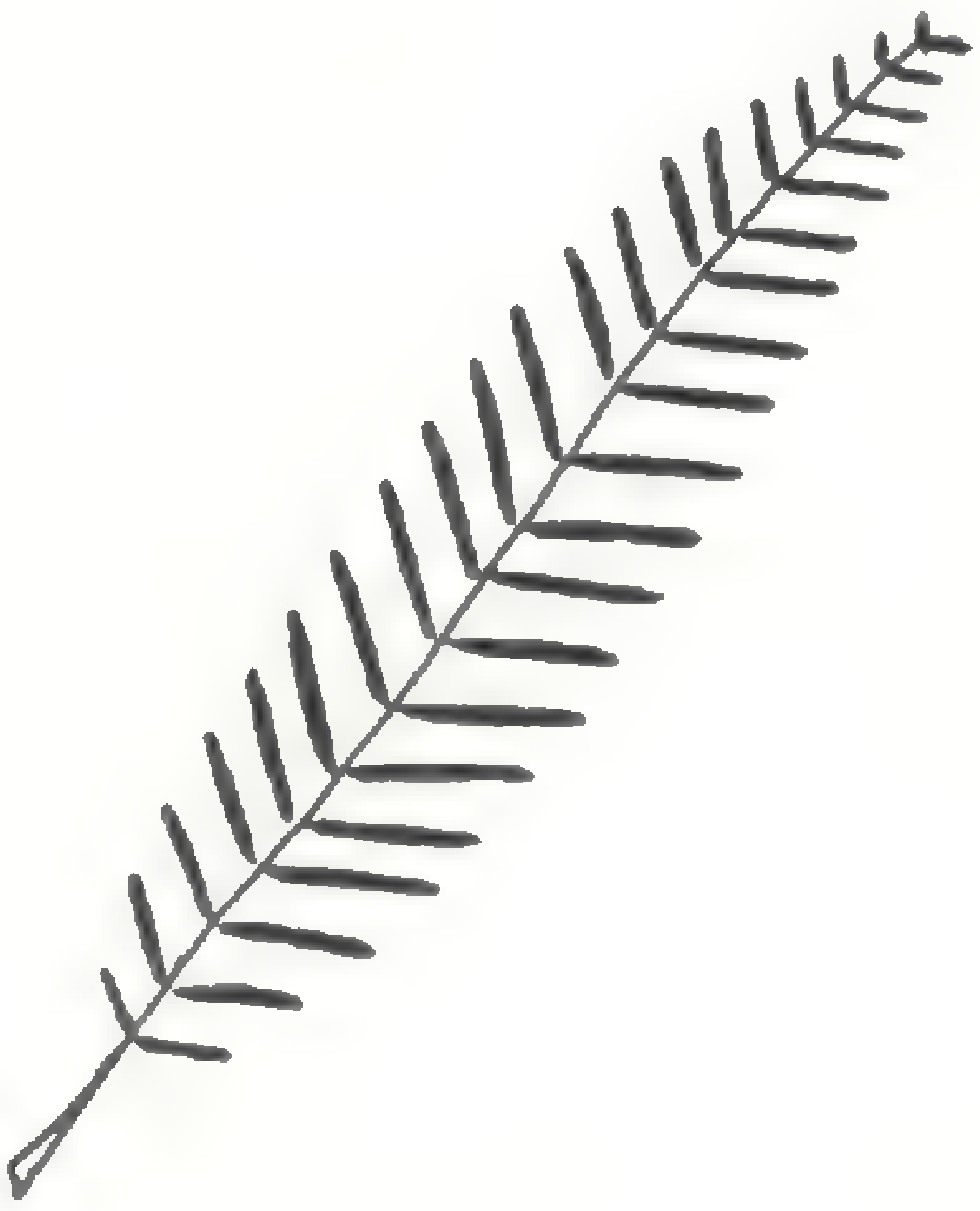
Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

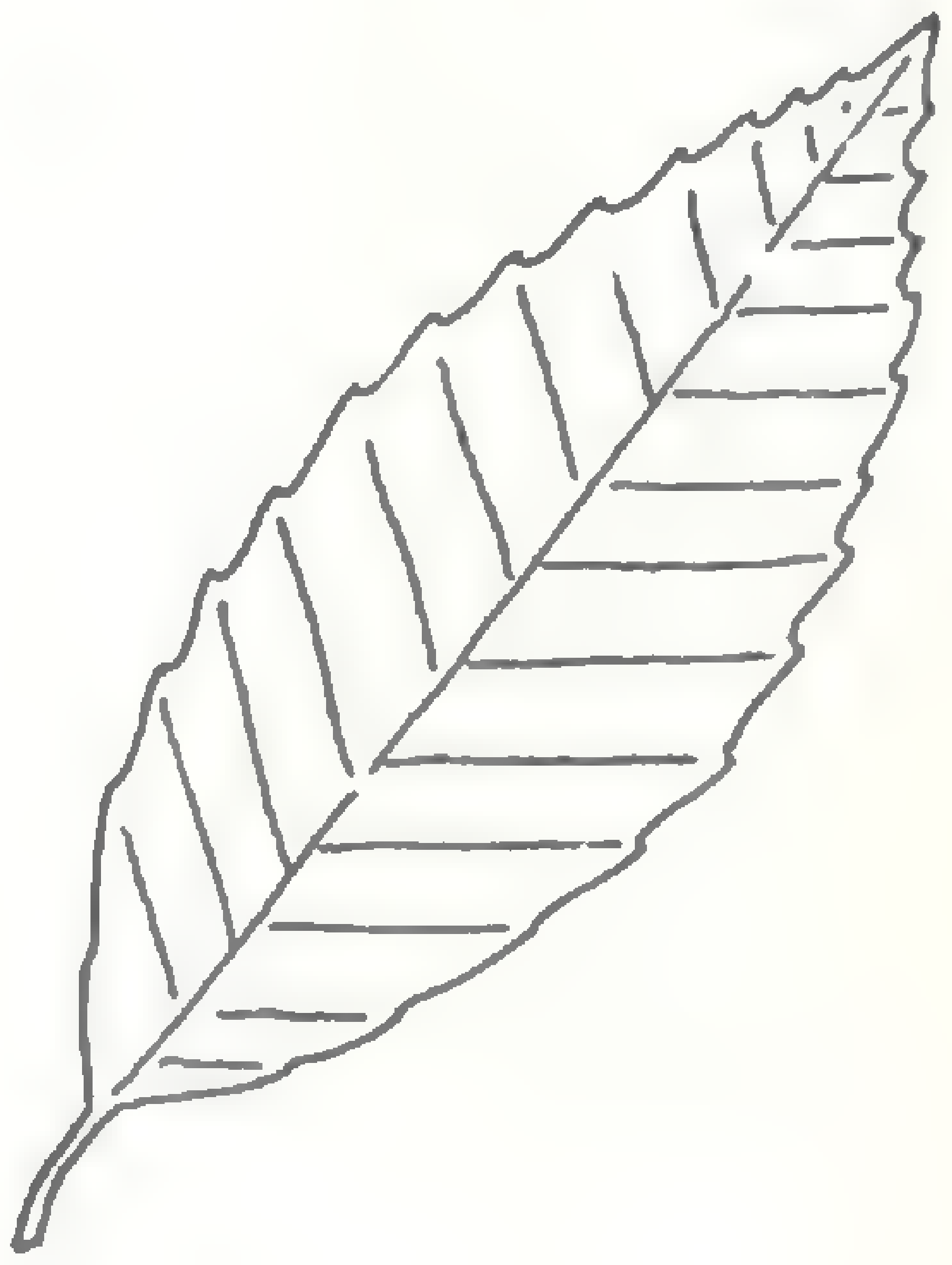
In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

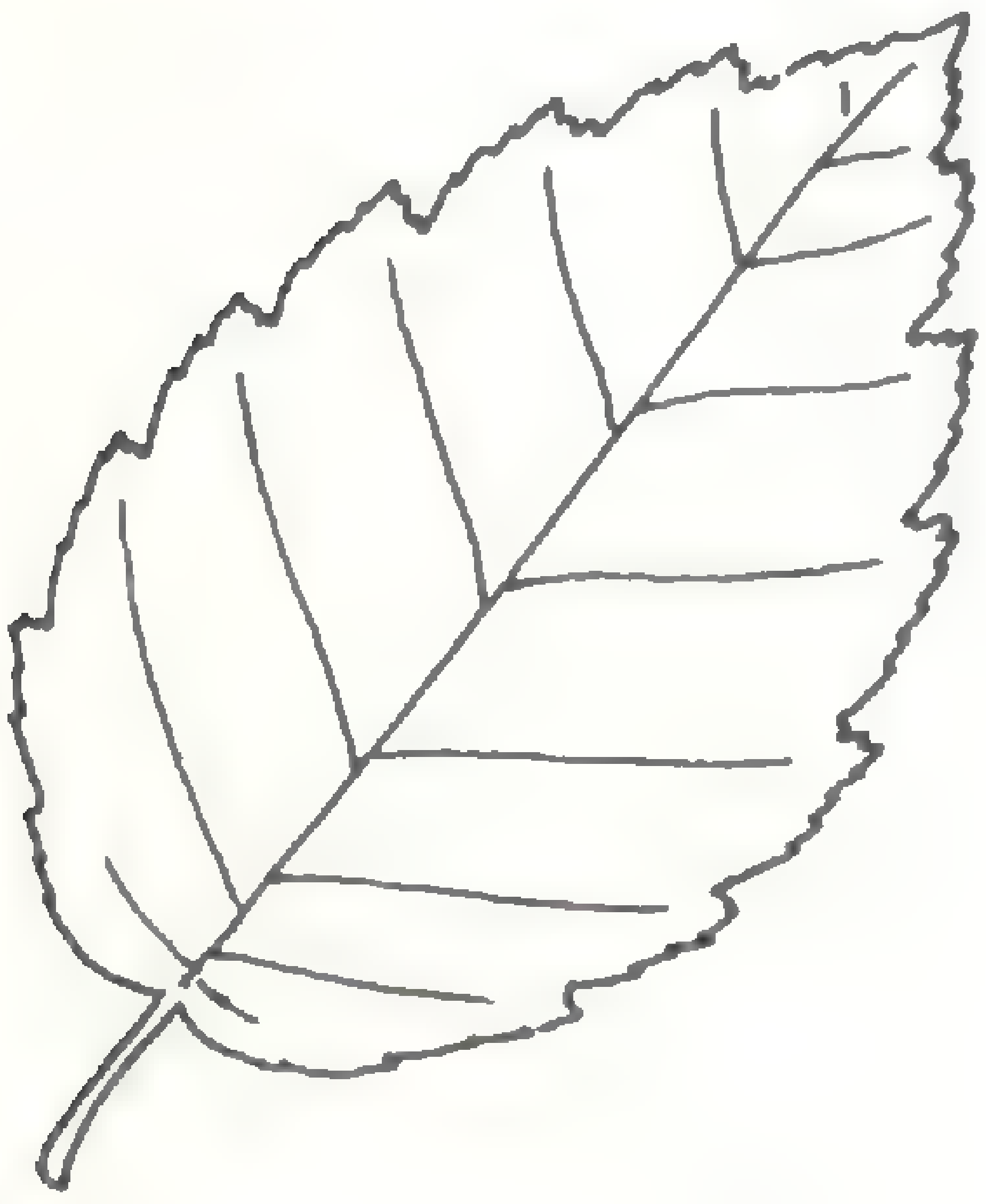
The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

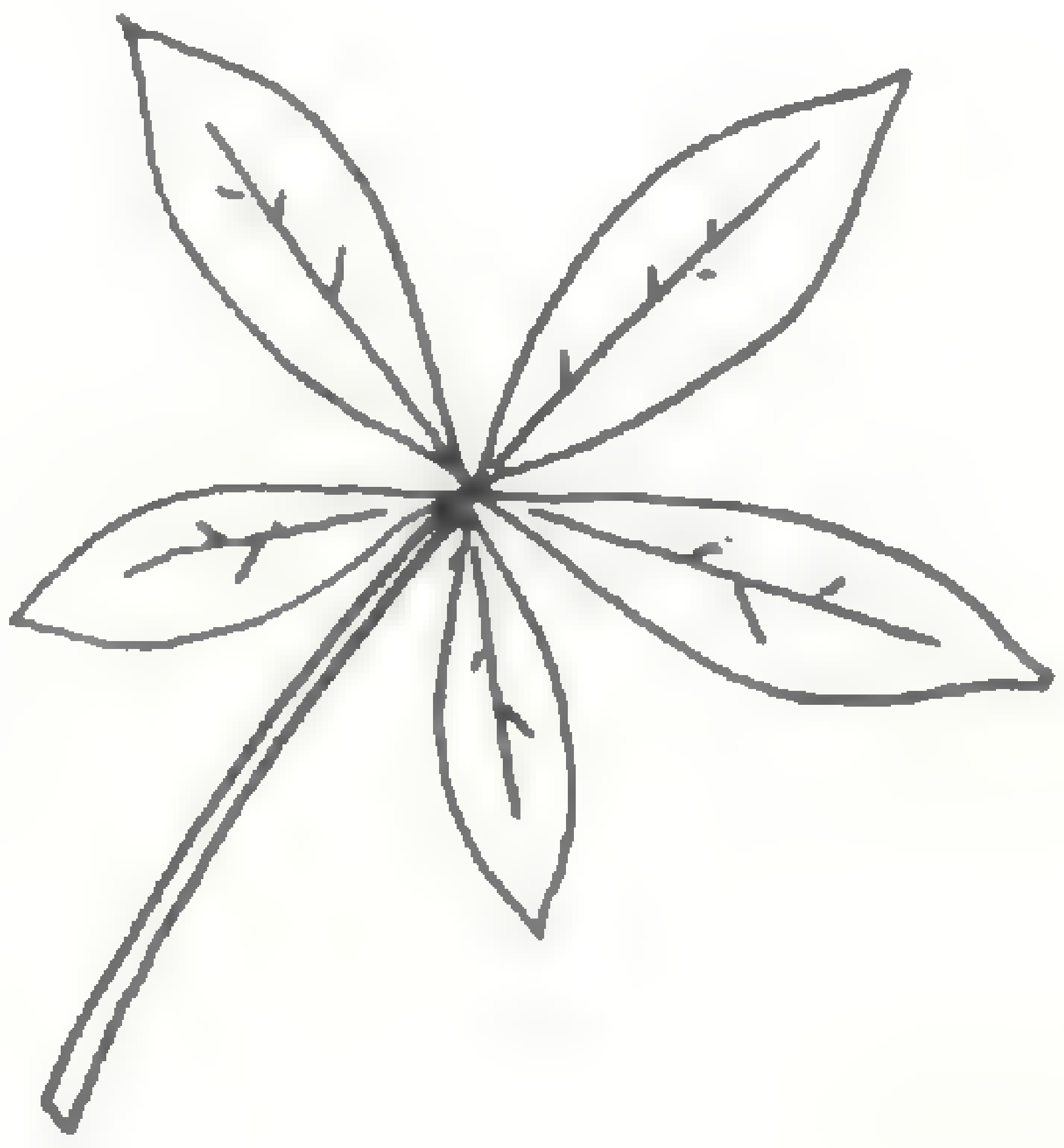
Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.

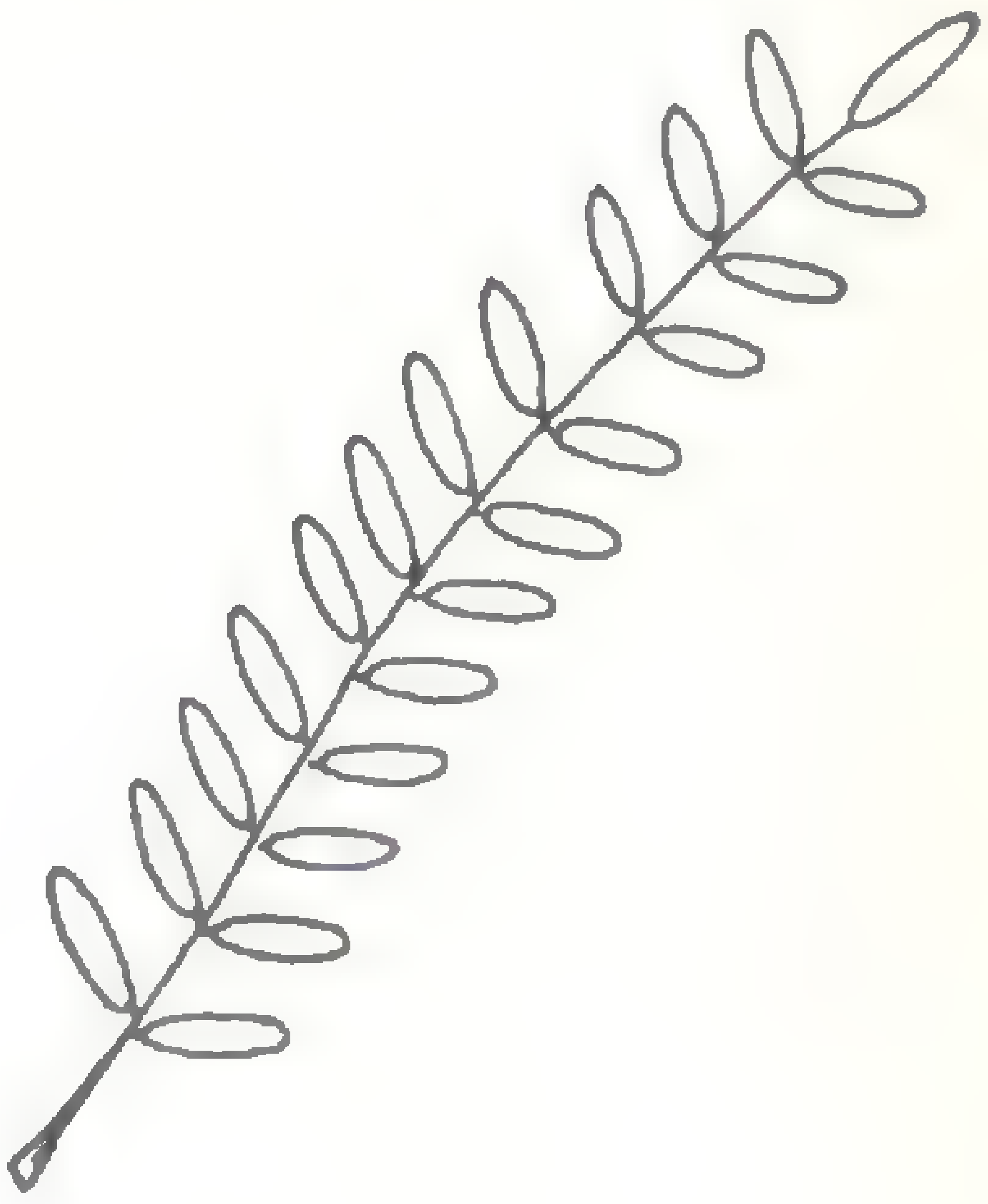
GOOD SHADE TREES
FOR THE
CENTRAL MIDWEST



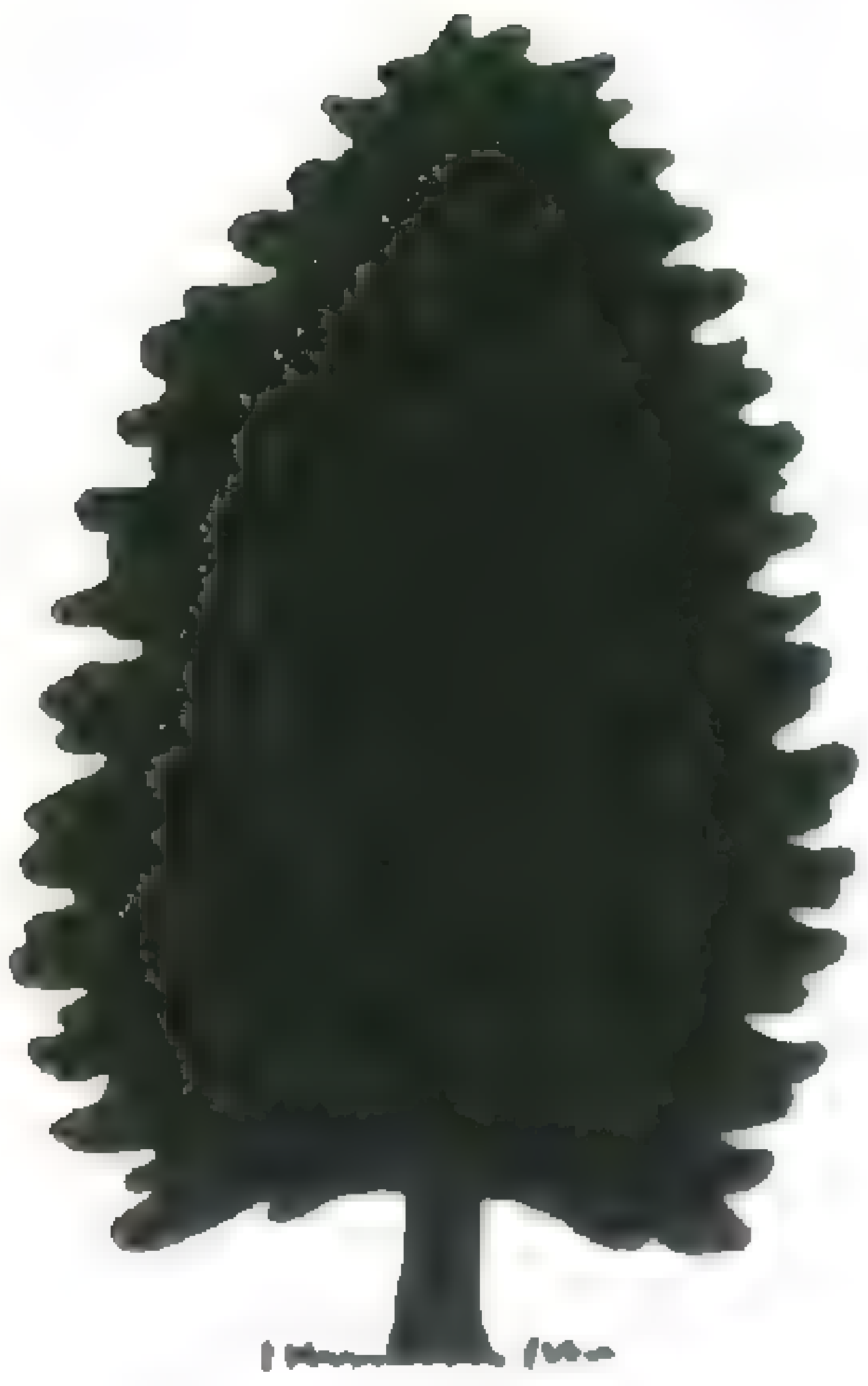




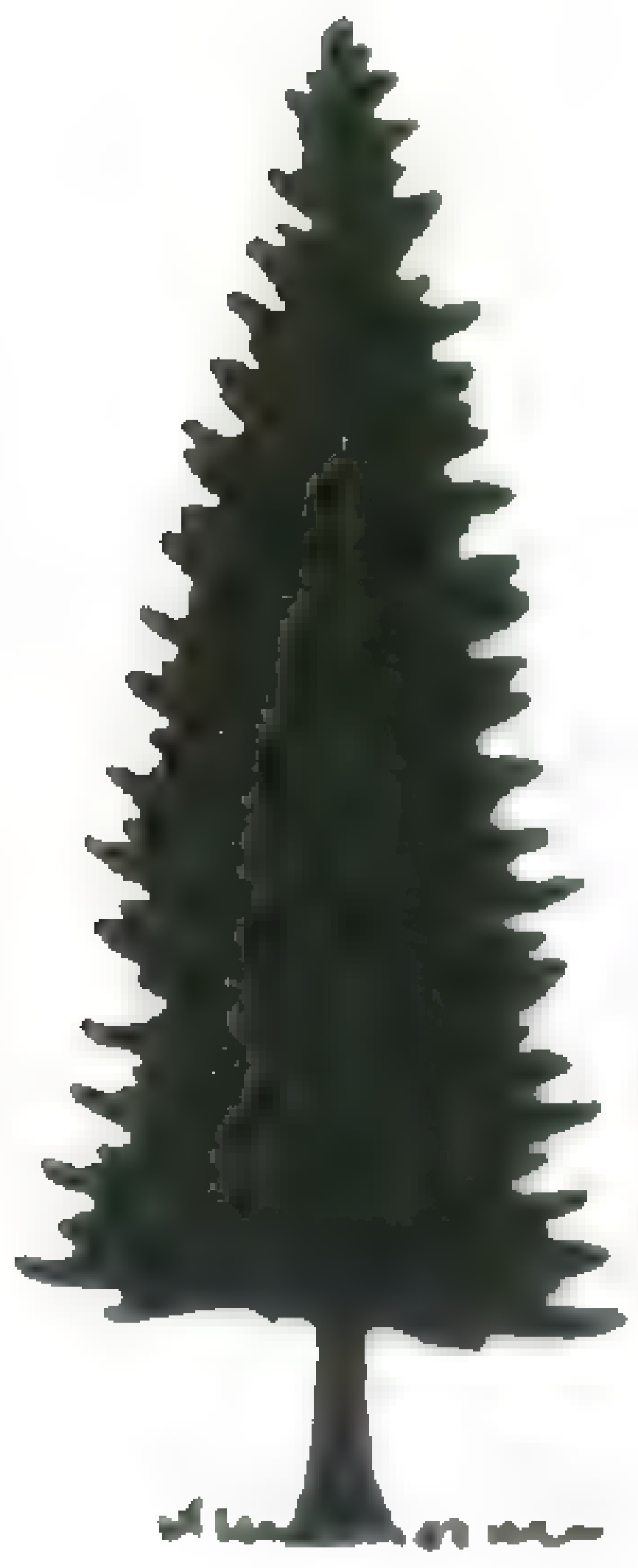




Missouri Botanical Garden Bulletin
Volume L November 1962 Number 9

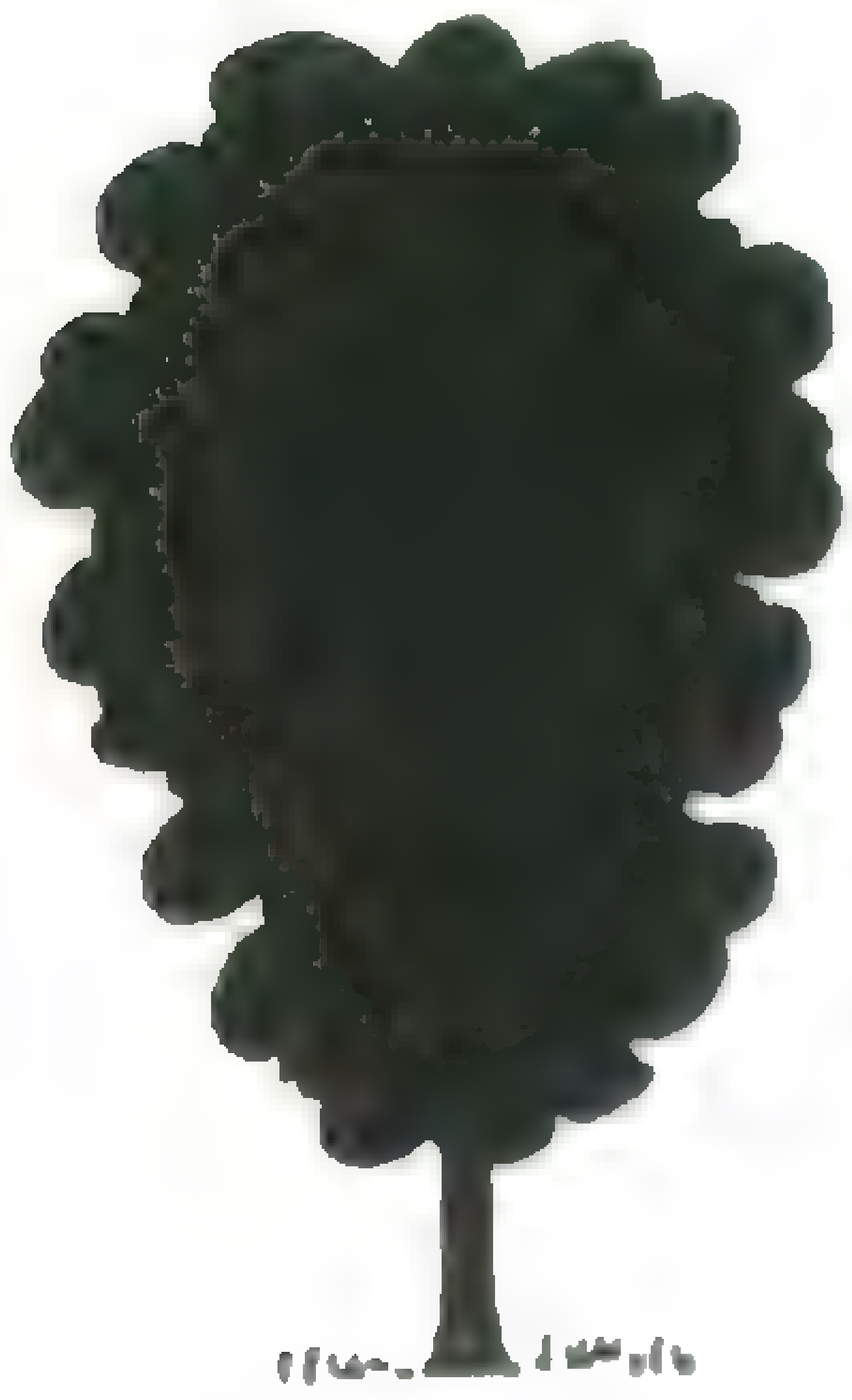


Beech

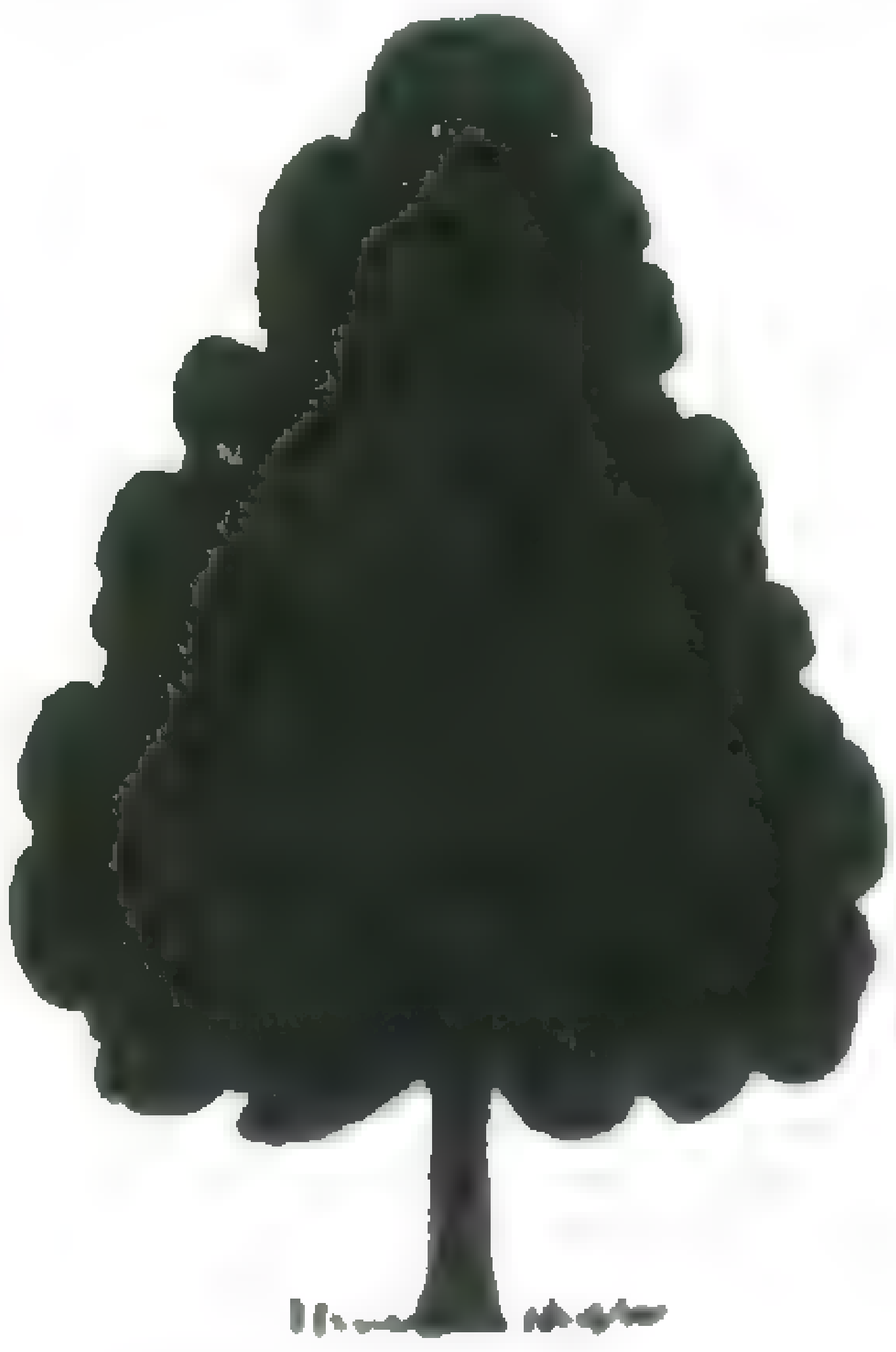


Bald Cypress

White Ash



Cottonwood



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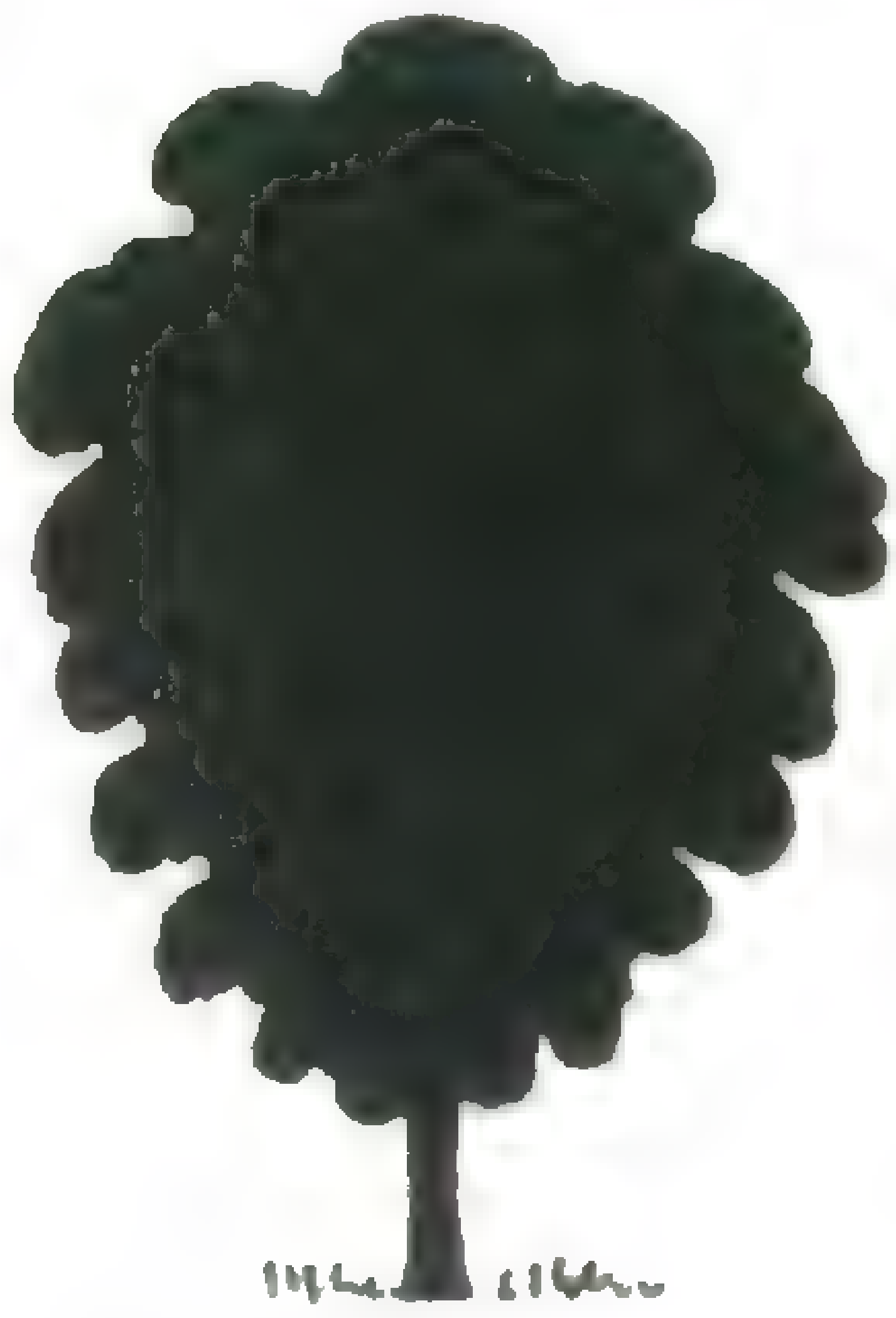

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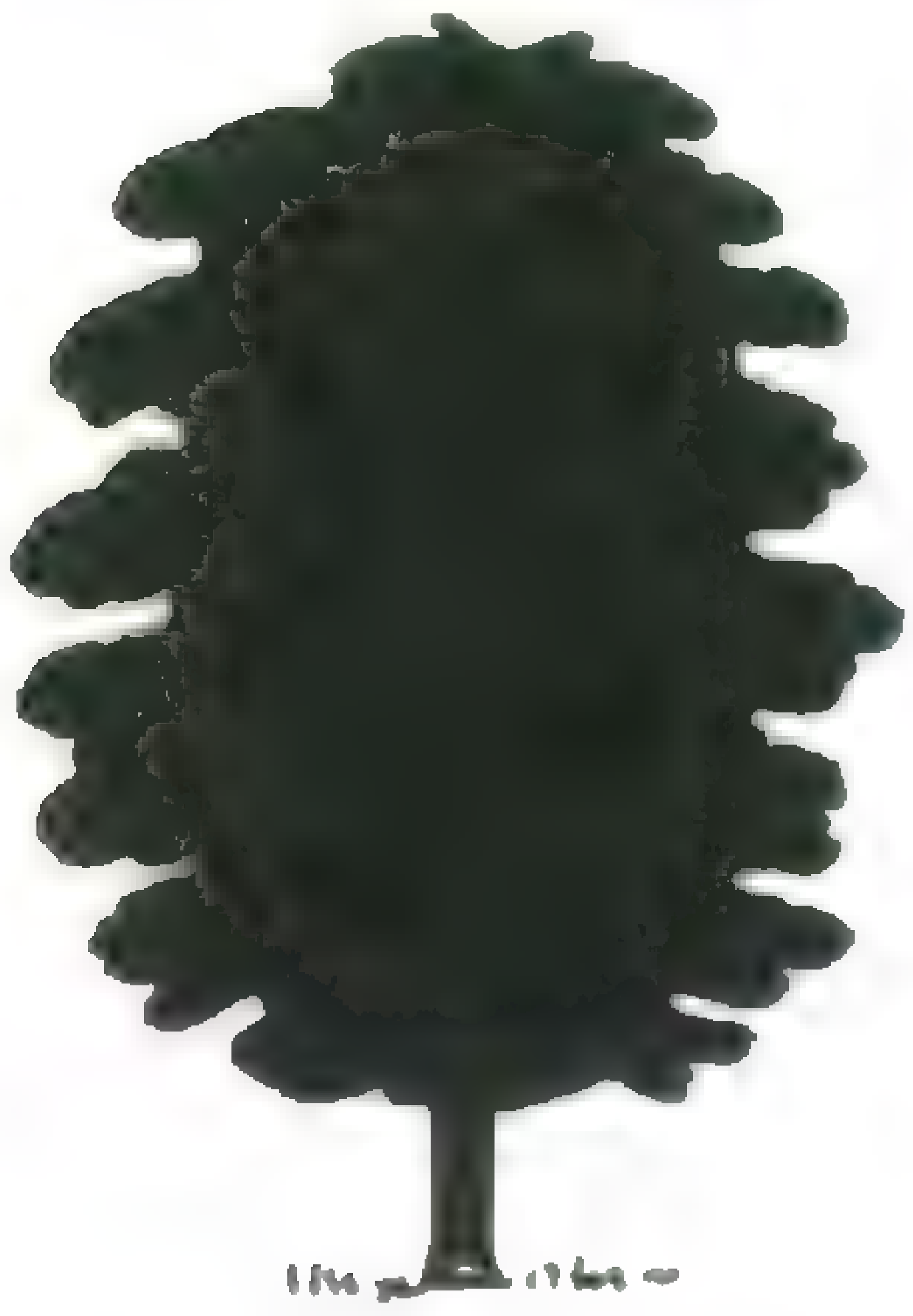

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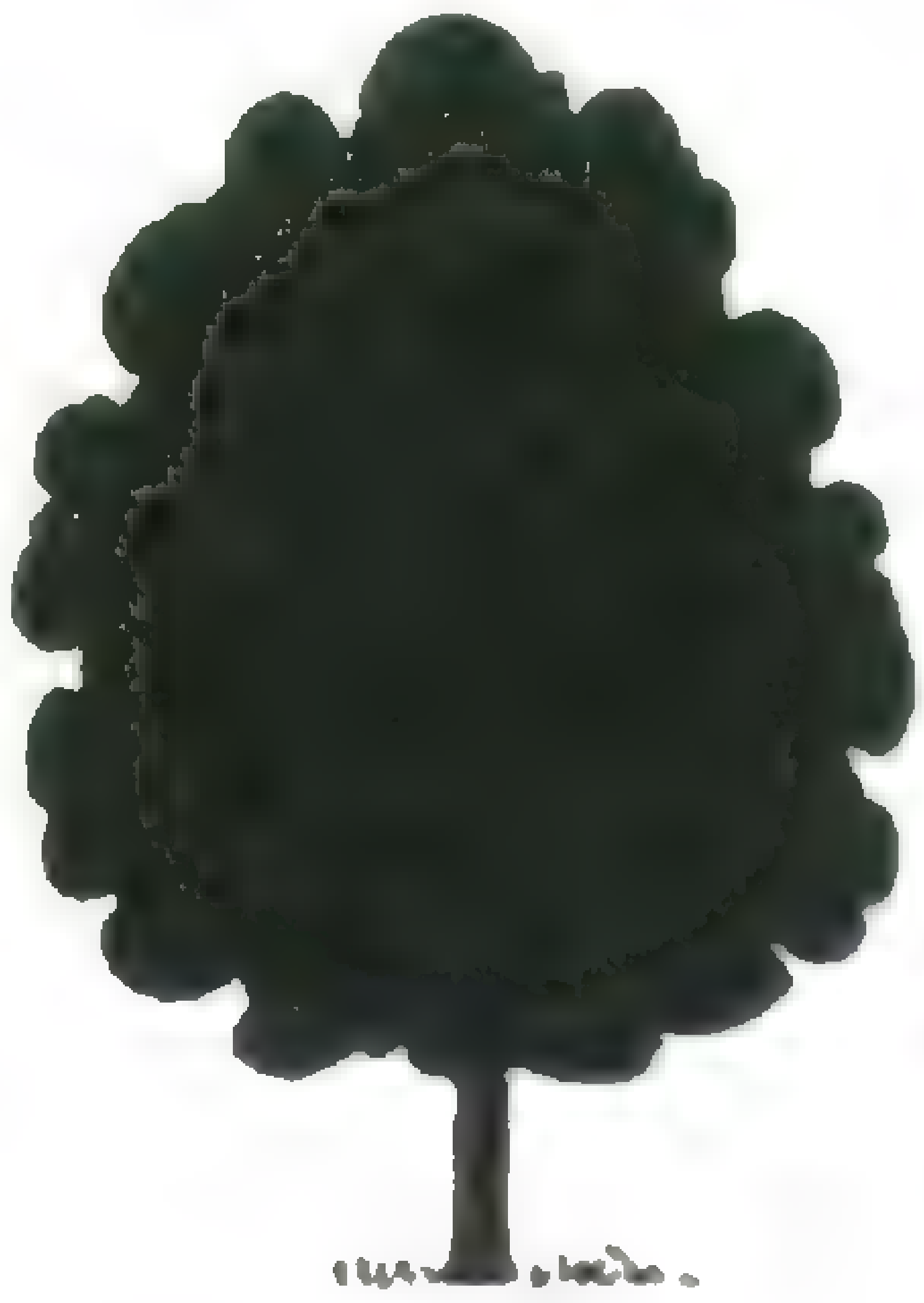

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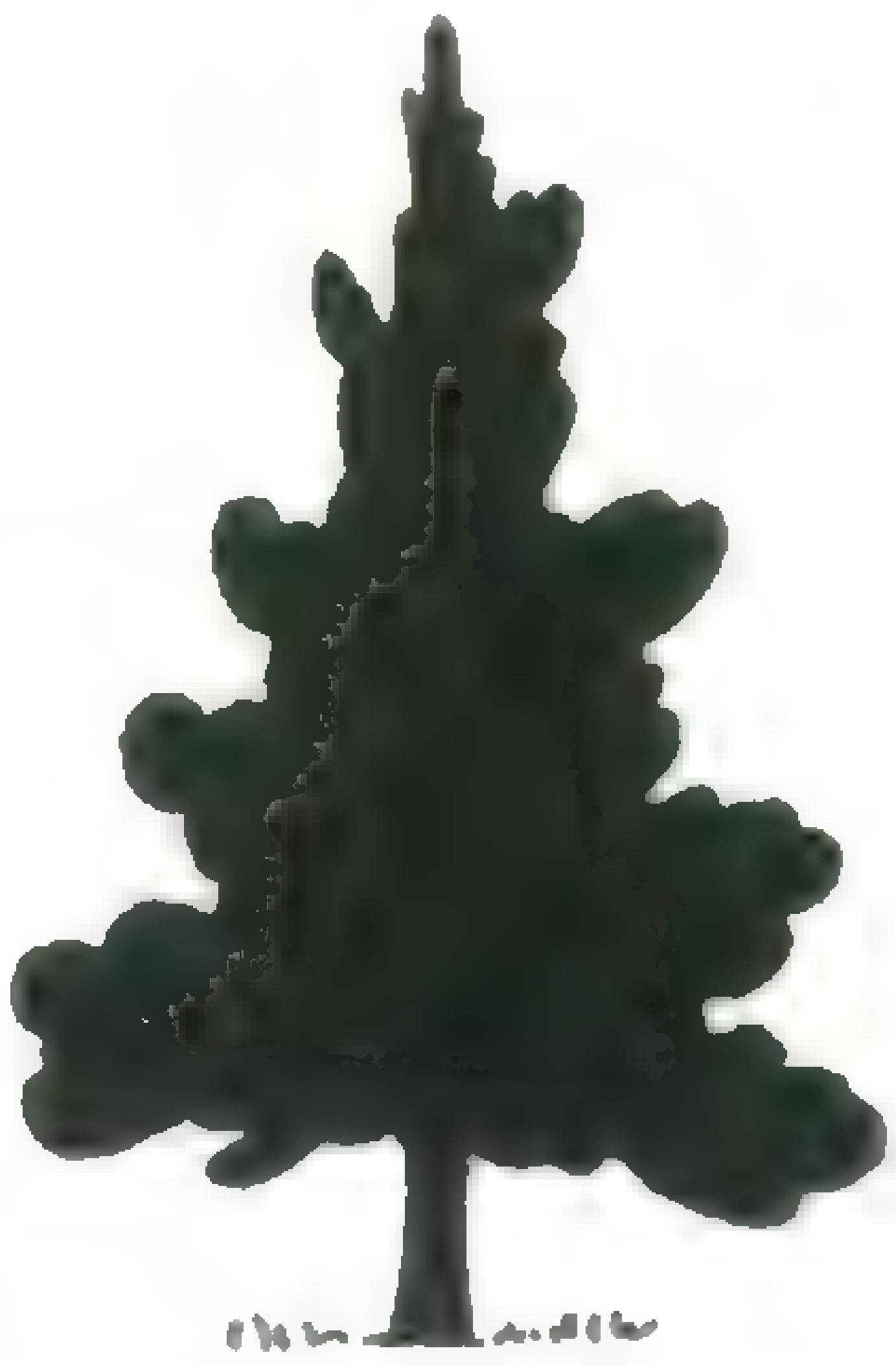


Ginkgo

COVER: Leaf outlines (for Bald Cypress, the outline is of a twig with many short, needle-like leaves), characteristic of trees mentioned in this bulletin, are shown on the front and rear covers. On the reverse side of each leaf outline (on the inside covers) appears the silhouette and name of the tree represented. Cover design and illustration by Louis G. Brenner.

This issue is a revision of the BULLETIN for April 1957 and is reprinted by popular demand.

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.
Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.
Editor for this issue: BRIAN GORDON
Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.
Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

GOOD SHADE TREES FOR THE CENTRAL MIDWEST

LOUIS G. BRENNER

It is not easy to select shade trees for the Central Midwest, particularly the St. Louis region. Because the local climate is characterized by extremes in temperature and rainfall many shade trees valued for their flowers, leaves or form of branching cannot be grown readily. Some shade trees of the Northeast where they grow in more moderate climatic conditions would be extremely difficult to grow in the Central Midwest where summer daytime temperatures may soar above 100 degrees, or where winter temperatures may vary as much as 50 degrees in less than 24 hours, often plunging to below-zero readings. The late spring freezes characteristic of this region often come at a time when the sap is rising in the trunk and the leaf and flower buds are swelling; consequently, flowers, young branches, or even small trees may be frozen. Periods of drought which may last from four to more than 12 weeks are usually combined with abnormally high temperatures and frequently result in midsummer defoliation, numerous dead branches and even death of trees. In this bulletin is presented a list of more than 20 shade trees which, through years of growing on the grounds at the Missouri Botanical Garden and in gardens and parks in the vicinity of St. Louis, have proved hardy to the many adversities of our Midwest climate. It is suggested that gardeners and homeowners select their shade trees from this list. Some of the good and bad features of each species and the soil conditions most favorable to its culture will be noted. The accepted methods of planting, pruning, fertilizing, watering and control of insect pests and diseases will be discussed briefly.

SUGGESTIONS FOR THE SELECTION OF SHADE TREES

Only when trees are carefully selected, considering such features as height at maturity, spread of branches, soil preferences, rate of growth and problems of maintenance above ground and in the soil, can they be relied upon to give continuing satisfaction and pleasure. Choosing the proper tree to fit the location is a prime consideration. For example, there is little need to plant a large shade tree in a small corner where it will require annual pruning to keep it within bounds. Today there is an ever-growing list of good small trees which are excellent planting material for ranch-house type of architecture. Trees of several sizes and shapes are to be found among those listed here. When selecting trees it is important to know the type of soil in which they are to be planted. Examine the soil to a depth of about two feet and determine its composition, whether clay, loam, sand. If, for example, a gummy, yellow or red clay is found, then select trees from the small group known to grow well on clay soil. Rate of growth of trees is another point for consideration. Many home owners, particularly those in new tree-bare subdivisions, are interested in fast-growing trees for quick shade. This is of course to be encouraged; however, fast-growing trees are usually not long-lived and are easily storm damaged. If their use is planned, then slower growing and more durable species should be planted in locations where permanent trees are desired, using the fast growers as fill-ins to be removed some five or ten years later or as soon as the permanent trees have made sufficient growth to provide some shade. Features of trees which may make them maintenance problems should be carefully considered. Certain trees can be a nuisance if planted near tile drains, for their moisture-loving roots seek out the tiniest opening in the drain to enter in search of water and soon the drain pipe is choked with a mass of roots. Some trees offer pruning problems if planted near walks and drives. Others are a nuisance when planted near walks, drives, or paved terraces because of their messy fruiting habits.

In the following list the trees have been arranged alphabetically according to their common names. Scientific names are added not only as a matter of interest but because they may be of value in obtaining the precise species desired, since common names are not uniform.

Ash.—Height: 60–80′; habit: round.

The ashes are large forest trees and should always be planted where they will have sufficient room to develop their broad spreading crowns. The White Ash, *Fraxinus americana,* is considered to be the best of the ash species for Midwest planting. It suffers shock of moving fairly well and is a rather fast-growing tree when established. Succeeding on most soil types, the White Ash will make fair growth in clay. It may be attacked by boring insects and should be examined frequently for their presence, especially during the first years after planting. Keeping the tree growing actively is the best guard against borers. The ash is subject also to attacks of several scale insects and may need periodic spraying. The tree offers interesting fall coloration in shades of orange through mauve-purple.

Bald Cypress.—Height: 80–90′; habit: narrowly pyramidal.

The Bald Cypress, *Taxodium distichum,* is a much neglected tree. It is best suited for large properties and, although primarily a tree of the southern swamplands, it has proved capable of fast growth on upland soils; however, it is not recommended for planting in clay soil. The fine feathery leaves turn a rich bronze in autumn and they and the small twigs that fall with them are so fine as to require no raking from the grass. More of these fine trees should be planted. They would make outstanding avenue trees for some city and subdivision streets.

BEECH.—Height: 30–60′; habit: pyramidal.

Fagus sylvatica var. *atropunicea,* the Copper Beech, a European species, is to be preferred over the native American Beech in average soil conditions. The Copper Beech is truly a tree of outstanding merit and should be treated as a specimen, never hidden in a corner nor crowded among other trees. The bronze blush of the expanding new leaves in spring is breath-taking and surpassed only by the deeper bronze-purple of the mature leaf. Good soil is recommended for the beech; and, because the feeding roots lie near the surface of the soil, it will grow best if heavily mulched and the lower branches permitted to sweep the ground. Columnar and weeping varieties of the Copper Beech are also available.

BIRCH.—Height: 40–60′; habit: pyramidal.

Unfortunately, the beautiful white-barked birches are considered poor planting material for the midwest because they are not drought resistant. Our native Red or River Birch, *Betula nigra,* a tree with red-brown bark, small leaves, and of graceful, pendulent branching habit is longer lived but requires a loam soil for even moderate success. The leaf miner, a tiny insect, some times skeletonizes the leaves in summer, and the trees should be sprayed soon after the leaves have fully expanded.

BUCKEYE or HORSE-CHESTNUT.—Height: 70′; habit: pyramidal.

The buckeyes are generally considered among the less desirable shade trees because of their large coarse leaves and fruits and their poor fall coloration. They are listed here because they will grow on most soils and they have few insect pests and diseases. The Horse-Chestnut is often admired for the above-average symmetry of the crown and also for the large showy, upright flower spikes which create a candelabra effect. The European species, *Aesculus hippocastanum,* is frequently planted. Although it forms a large and stately tree, it has the disadvantage of having weak wood which is easily broken by wind and ice. Also the leaves are susceptible to a rust which may cause them to become brown and fall in late summer. The Baumann Horse-Chestnut, *Aesculus hippocastanum baumanni,* has double flowers which are not only showy but are followed by few seeds, since the extra petals are formed from parts of the flower ordinarily involved in seed production. The hybrid Ruby Horse-Chestnut, × *Aesculus carnea briotii,* is somewhat more rust-resistant and has flowers larger than those in the common Horse-Chestnut. Flowers of the Ruby Horse-Chestnut are bright scarlet in contrast to the pale, flesh color of the common species. Horse-Chestnuts bear two or three seeds or buckeyes in a spherical pod about two inches in diameter, with a tough, warty or spiny outer coating. Seeds and pods clutter the lawn when they fall in September. Older trees producing fruit in quantity make it necessary to rake the lawn before mowing to prevent the mower blades from jamming on the hulls. The modern rotary mower will, of course, mow over the hulls shattering them but leaving a rough-appearing lawn.

COTTONWOOD.—Height: 70′; habit: widespreading.

The Cottonwood, also known as Poplar, has an important place in this list. The Eastern Cottonwood, *Populus deltoides*, recommended here, is a rapidly growing tree and fills the need for quick shade so often demanded by owners of new tree-bare homes. However, since the Cottonwood and all other poplars are short-lived trees (15–20 years), they are most useful as temporary plantings among more desirable long-lived trees. The Cottonwood will grow on most soils; but it has a great affinity for water and will rapidly clog drains if it has the opportunity. The leaves become yellow in the fall and the gray-green of the bark on younger limbs may serve the same decorative purpose as the bark of the birch and sycamore. Unlike most trees the Cottonwood has leaves so constructed (the petiole if flattened in a plane perpendicular to the plane of the leaf-blade) that the slightest movement of air causes the leaves to quake. Thus on warm summer evenings the rustling of the leaves of the Cottonwood gives the impression that there is more movement of air than there actually is and may result in a pleasant cooling sensation. The Cottonwood has few insect pests. It has the bad habit of dropping its leaves during summer at any time that it may suffer a shortage of water.

The Lombardy Poplar, *Populus nigra italica,* the well-known graceful, columnar poplar, should also be included; although the Simon Poplar, *Populus Simoni,* which forms a less compact column, is more winter-hardy and also seems to withstand summer heat and drought better. Since these poplars tend to have numerous dead limbs and trunks as they approach 15 years of age, when used as screen plantings they should be cut to short stumps periodically. If such cutting is followed by moderate application of fertilizer and abundant water, the poplars rapidly renew the screen effect.

ELM.—The elms are mentioned here with words of caution and without recommendation. Prevalence of two serious diseases, the much dreaded Dutch Elm Disease and Phloem Necrosis, for which as yet complete cures are not known, make them of questionable value. For those insisting on the elm, the Smooth-leaved Elm, *Ulmus carpinifolia,* of the variety "Christine Busiman" is reportedly resistant to both diseases mentioned.

GINKGO.—Height: 80′; habit: broadly pyramidal to columnar.

The Ginkgo, *Ginkgo biloba,* is an outstanding tree for Midwest planting, succeeding on most kinds of soil and tolerant of urban conditions. It attains considerable size at maturity (more than 50 years), and should be planted with this in mind. Ginkgo is essentially columnar in youth and develops a broad pyramidal habit with age. A selected type, the Sentry Ginkgo, maintains its columnar form throughout life and is well suited for avenue planting provided only male trees are planted. Female trees of the Ginkgo can be a nuisance in late fall if planted where the fallen fleshy persimmon-like fruits may be crushed, for the pulp is putrid, containing butyric acid, the same acid present in rancid butter. The trees are of easy maintenance, having no insect pests or diseases.

HACKBERRY.—Height: 50–70′; habit: round.

The hackberry with its small leaves, rounded crown, ease of moving and adaptability to most soils could well be looked upon as a substitute for the elm; however, being of more erect branching habit it lacks the graceful appearance of elms, particularly the American Elm. The trees bear large quantities of small, round, blue-black fruits which are much enjoyed by many kinds of birds in winter. The native Hackberry, *Celtis occidentalis*, is susceptible to a fungus causing a great massing of smaller twigs into what is called a "Witches Broom." Such fungus attacks rarely prove fatal to the tree and result in the interesting "tufted" appearance of the branches in winter. Witches Brooms are less common on the Sugar Hackberry, *Celtis laevigata*, of the southern states, which may be grown here. Asiatic species of Hackberry are free from the fungus but they are not commonly available in the nursery trade.

HONEY-LOCUST.—Height: 70–90′; habit: round.

The Honey-Locust, *Gleditsia triacanthos*, has long been neglected as a shade tree in the Midwest. Locusts make ideal lawn trees because they leaf-out late in spring and drop leaves early in fall permitting plenty of sunlight to reach the lawn in the cooler seasons. The tree grows rather fast even on clay subsoil. In some areas this tree is sometimes ravaged by attacks of the webworm. Since the common native variety habitually arms itself with vicious thorns, often four inches or more in length, the thornless type sold under the patented name of "Moraine Locust" is recommended. The Honey Locust is sometimes considered an untidy lawn tree because the much-twisted strap-like pods need to be raked from the lawn in the fall, winter, and very early spring. Pods remaining on the tree in winter do have a decorative value. The thornless Moraine Locust is sterile and few if any pods are formed.

LINDEN.—Height: 60–80′; habit: pyramidal.

The American Linden, *Tilia americana*, is a forest tree with large leaves. Its fall coloration is dull and it grows poorly on graded sites with clay subsoil. For home planting, the Silver Linden, *Tilia tomentosa*, and Little-leaf Linden, *Tilia cordata*, both European species, are considered superior. The Silver Linden is an average size tree and does well in dry situations. The Little-leaf Linden is a smaller tree than the foregoing and is somewhat slower growing. These trees have few insect pests and diseases and are thus easy to maintain. The small flowers of the Linden are borne on special, long, spatulate-shaped leaves; their fragrance attracts honey bees that make an excellent honey from the nectar.

Maple.—Height: 30–70′; habit: round.

The maples comprise a group of much-loved shade and lawn trees. Perhaps best known is the Silver Maple, *Acer saccharinum,* commonly planted because of its rapid growth and ability to grow on even the worst soils. It is a tree of few pests, but the wood is soft and is liable to much injury from winter ice storms. The Red Maple, *Acer rubrum,* is also considered to have weak and brittle wood and, like the Silver Maple, suffers ice damage. However, because of its bright red flowers in very early spring and its brilliant red and orange foliage in the fall, it is considered superior to the faster-growing Silver Maple. Maples with harder, more durable wood are the Sugar Maple, *Acer saccharum,* slow-growing and with brilliant fall colors, and the Norway Maple, *Acer planatoides,* which makes a superior lawn tree and is faster growing than the Sugar Maple. Norway Maples may be had in several varieties, of which "Crimson King" is outstanding for its deep purplish-red leaves. The Japanese Maple, *Acer palmatum,* and the Hornbeam Maple, *Acer carpinifolium,* are two small maples reaching 20–30 feet in height and usable for small homes and yards. Most maples have numerous shallow feeding roots and cast rather dense shade, making lawn management beneath them difficult.

Oak.—Height: 70–90′; habit: pyramidal.

Oaks have a long life span and their tough wood enables them to withstand the worst storms. Despite the fact that they are reputedly slow-growing, they may compete favorably with more rapid-growing trees if they are fertilized. The White Oak, *Quercus alba,* is one of the most majestic trees, although it is rather difficult to move and establish. It will grow best in loam, or loamy clay soil. The Bur Oak, *Quercus macrocarpa,* makes a superb tree of moderate growth. A faster-growing oak than those previously mentioned is the Northern Red Oak, *Quercus borealis*; and it is easier to move and establish. It too is a very desirable tree and reaches great size as do all the oaks mentioned here. The Pin Oak, *Quercus palustris,* is perhaps the most commonly planted oak. Although it is a fast-growing tree and responds well to fertilizers, it has a much shorter life span than most oaks and will probably need to be removed in 40–50 years. The habit of holding many of its leaves through the winter and dropping them in very early spring makes the Pin Oak a nuisance to meticulous gardeners. All the oaks mentioned here present fine autumn coloring in various shades of red and purple.

Sweet Gum.—Height: 50–70′; habit: pyramidal.

The Sweet Gum, *Liquidamber Styraciflua,* has proved to be an excellent tree for Midwest planting. It is easy to move when bought with a burlapped ball of soil, and it grows well in almost any soil. The star-shaped leaves turn shades of orange then shades of scarlet with the first autumn frosts. The fruits are horned balls about 1 inch in diameter and the seeds are eagerly sought in the grass beneath the trees by such birds as quail, cardinals and sparrows. Most of the seed balls decorate the tree throughout the winter. Occasionally the trees may need to be sprayed for the Tussock Moth and Tent Caterpillar.

SYCAMORE. — Height: 80′; habit: broadly pyramidal.

The Sycamore is so commonly planted on our city streets that it hardly needs introduction. It is very adaptable to most soil conditions and even makes fair growth on clay sub-soils. It withstands the heat and contaminated air of our large cities and is a reasonably fast growing tree. Our common native Sycamore, *Platanus occidentalis*, is susceptible to a twig and leaf blight commonly known as Sycamore Anthracnose, which often appears during spring months when weather is unseasonably cold and wet. Control is difficult; lacking control, infected trees become unsightly and eventually die. Thousands of Sycamores in the St. Louis area have been cut down in the past few years as a result of this disease. Sycamores are all coarse leaved trees with the bad habit of dropping leaves and shedding bark throughout the growing season; although the smooth, light-colored newly-exposed bark is one of the most attractive features of these trees. New leaves of Sycamores have many fine hairs on their lower surfaces, and as the leaves become fully expanded and mature the hairs are blown loose and may cause a nasal irritation to some people.

TULIP TREE.—Height: 80′; habit: pyramidal.

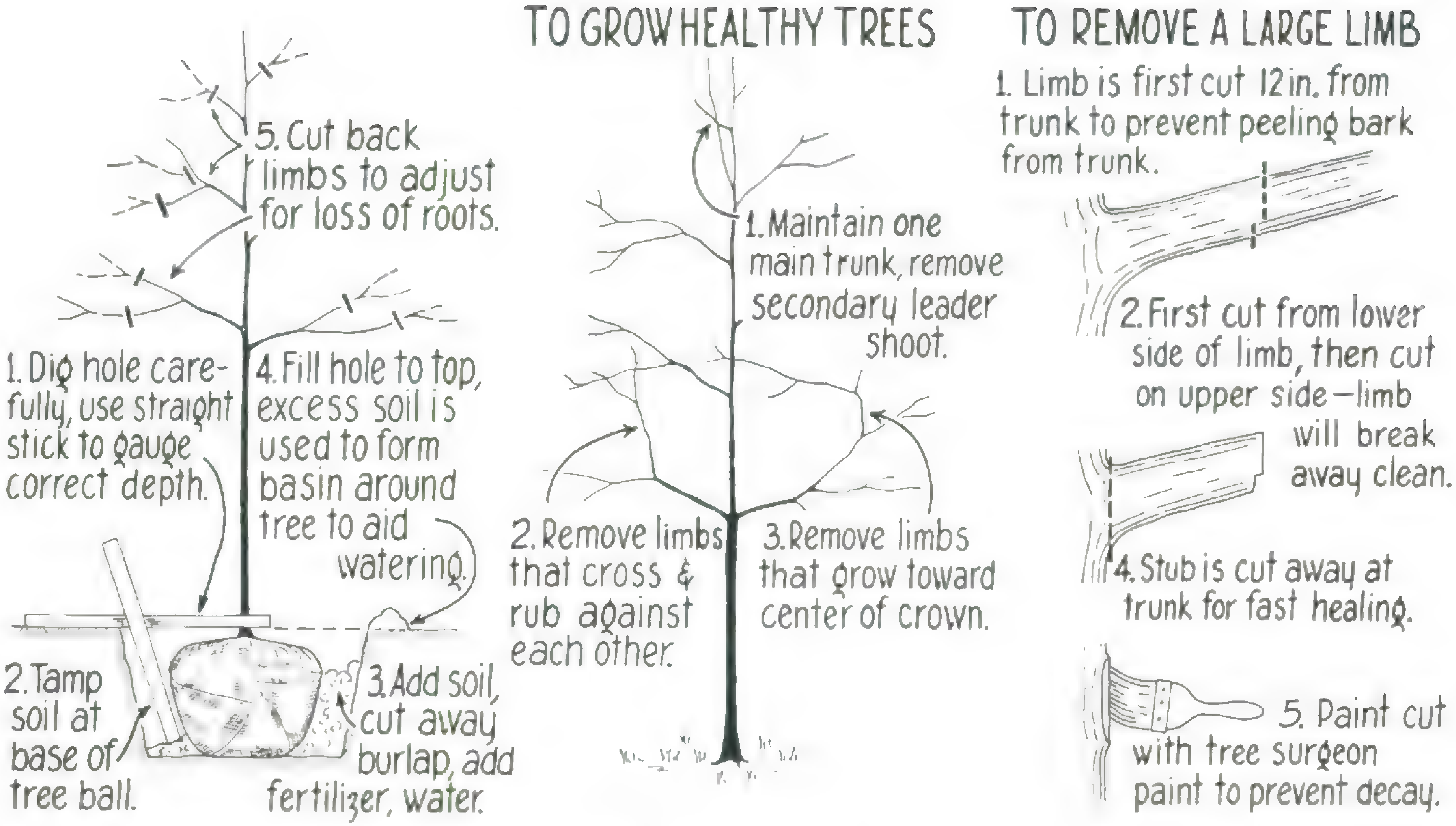
The Tulip Tree, *Liriodendron tulipifera,* has been so named because the pale, yellow-green flowers resemble a broadly expanded tulip. Were it not for the fact that the flowers are usually hidden by the leaves the Tulip Tree would be a very showy tree. The tree grows to great size and succeeds best on a loam soil. It it not an easy tree to move and every precaution should be taken to make sure the fleshy roots do not dry out when it is taken from the ground. It has few insect pests and diseases. A columnar form of the Tulip Tree is an attractive avenue tree. The leaves turn bright yellow in autumn.

ZELKOVA.—Height: 40′; habit: round.

The Zelkova, or, more properly, Japanese Zelkova, *Zelkova serrata,* makes an excellent substitute for the elm, to which it is closely related. It is a fine tree for the smaller homes and gardens and bears small elm-like leaves that turn a light golden yellow in early fall. It develops a wide-spreading rounded crown and since the wood is tough and limber it bears up well under our dreaded winter ice. Like the elm, the tree is easily moved.

HOW TO PLANT AND CARE FOR SHADE TREES

Planting.—Usually the better grade of trees bought from the nursery are sold with a ball of soil about the roots tightly wrapped in burlap. These trees are listed in the nursery catalog as "B&B," or "balled and burlapped." Such trees, aside from being heavy, are by far the easiest to handle in planting

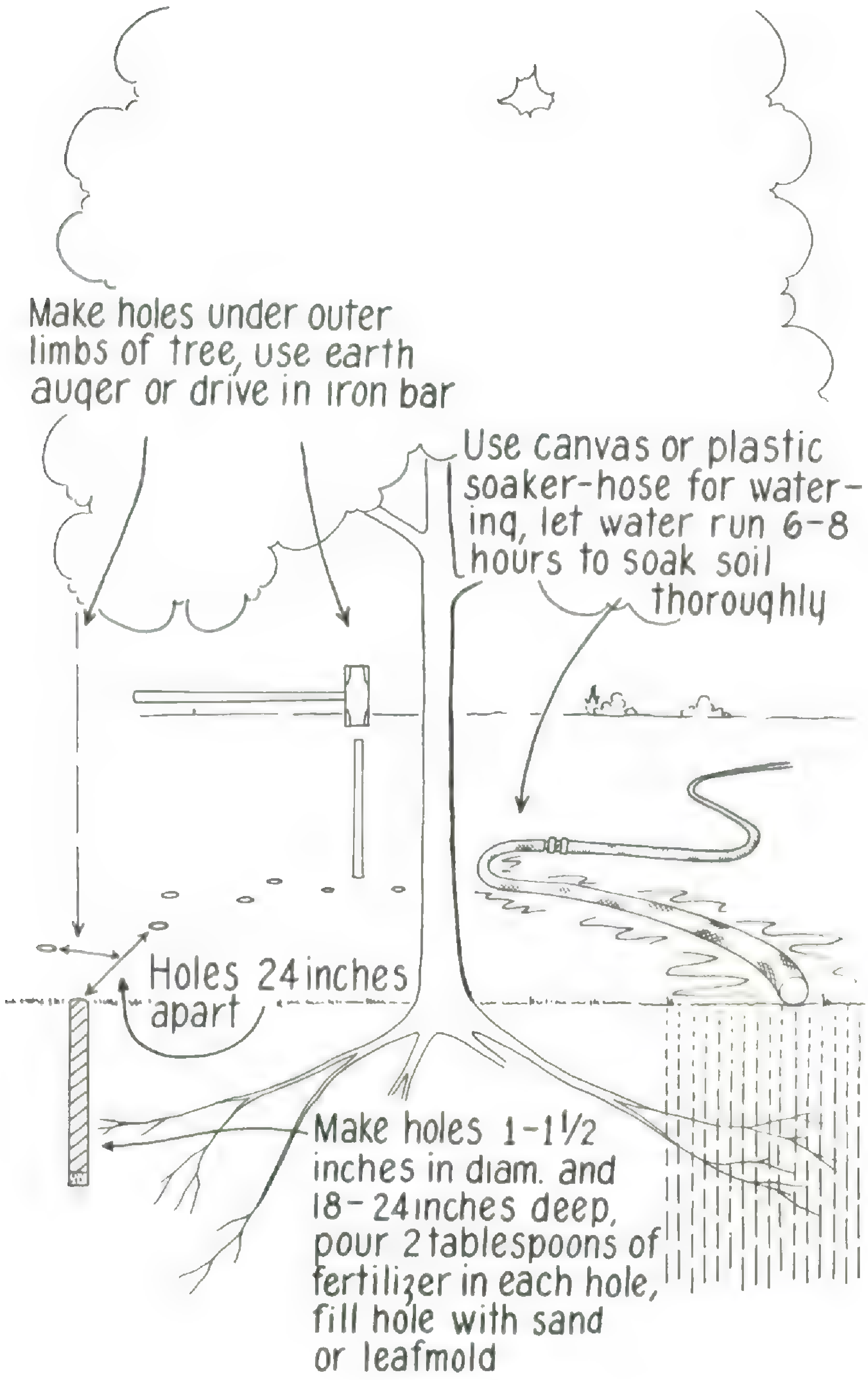

TO GROW HEALTHY TREES
TO REMOVE A LARGE LIMB
5. Cut back limbs to adjust for loss of roots.
1. Dig hole carefully, use straight stick to gauge correct depth.
4. Fill hole to top, excess soil is used to form basin around tree to aid watering.
2. Tamp soil at base of tree ball.
3. Add soil, cut away burlap, add fertilizer, water.
1. Maintain one main trunk, remove secondary leader shoot.
2. Remove limbs that cross & rub against each other.
3. Remove limbs that grow toward center of crown.
1. Limb is first cut 12 in. from trunk to prevent peeling bark from trunk.
2. First cut from lower side of limb, then cut on upper side—limb will break away clean.
4. Stub is cut away at trunk for fast healing.
5. Paint cut with tree surgeon paint to prevent decay.

PROCEDURE FOR TREE PLANTING AND PRUNING

Left: step by step procedure for tree planting.
Center: limbs to be removed in order to grow stronger, healthier, and more shapely trees.
Right: procedure for removal of limbs 1½ inches, or larger, in diameter.

and they are quick to re-establish in the new site. Many small trees are sold in tin cans or similar containers, which makes them easy to plant with high degree of success. An additional feature of the canned tree material is the fact that unplanted stock may be safely left for days or weeks before planting, provided it is watered occasionally. Unplanted balled stock may be held over for several weeks if soil or mulching material, such as sawdust, is heaped about the ball and kept moist. Some trees, Elm, Silver Maple, and Sycamore, are so easily moved that they are often sold "bare-rooted," that is, without soil about the roots. The added cost of buying trees either balled and burlapped or grown in cans should be discounted because such plants become established quicker than those moved with bare roots.

The secret of success with balled or canned stock is in the undisturbed contact of the root with the soil. Every precaution to prevent cracking or breaking of the ball must be taken when handling the tree. Having selected the site for the tree, dig a hole with a diameter 8 to 12 inches greater than the measurement across the ball at the base of the tree trunk, not more than one inch deeper than the depth of the ball. Careful excavation permits the ball to rest on solid soil and makes it easy to finish the planting job with the tree standing straight at correct depth. Lower the balled tree gently into the hole. *DO NOT REMOVE THE BURLAP WRAPPING ABOUT THE ROOTS.* Tree roots easily penetrate the burlap, which decays rapidly. Trees grown in cans should be removed by slitting the can down the side from top to bottom; then tear the side of the can loose from the bottom to expose the plug-shaped mass of roots and soil. A pair of heavy leather gloves should be worn to protect the hands from possible gashes when removing the ball of soil and roots from the can. After the tree has been removed from the can it must be handled gently to prevent loosening the soil about the roots. Now with the ball placed in the center of the hole, lay a straight stick across the hole to check the planting depth of the ball. If the hole is dug to correct depth there will be no more than one inch between the stick and the top of the ball at the base of the tree. For trees having trunks one inch or less in diameter, this distance should not be more than one-half inch. Add a little soil about the base of the ball and make minor adjustments in straightening the tree, then carefully tamp the soil at the base using a piece of 2 × 2 or 2 × 4 lumber about five feet long as a tamper. Fill the remainder of the hole around the ball, alternately tamping and adding soil to about four inches from the top. At this point, if planting a balled and burlapped tree, the burlap binding should be cut loose at the top of the ball and laid back over the soil surrounding the ball. Add a small amount of complete fertilizer (one tablespoon for trees grown in one-gallon cans, a small handful for those grown in five-gallon cans or for burlapped balls from 12 to 24 inches in diameter). Wet down with a bucket or two of water, and after it has soaked in finish filling in soil about


Make holes under outer limbs of tree, use earth auger or drive in iron bar
Use canvas or plastic soaker-hose for watering, let water run 6-8 hours to soak soil thoroughly
Holes 24 inches apart
Make holes 1-1½ inches in diam. and 18-24 inches deep, pour 2 tablespoons of fertilizer in each hole, fill hole with sand or leafmold

Procedure for Fertilizing and Watering Trees the ball. The excess soil that remains after planting should be used to form a shallow basin at the base of the tree to aid in watering it. Soak the soil about the newly planted tree by letting a hose trickle very slowly in at least four equally spaced positions about the hole so that all settling of soil will be equal and the tree will stand straight.

Watering.—Trees normally require great quantities of water if they are to thrive and make rapid growth. Fertilized trees must be given plenty of moisture to take full advantage of the added fertilizer. If during the growing season there has been no rain for over three weeks, the trees should be watered, especially newly planted trees. Watering can be done effectively with the soaker hose or an ordinary garden hose, with water merely trickling, laid on the ground beneath the tree branches. Trees, particularly those newly planted, should also be watered during dry periods of the winter months when the ground is not frozen.

Fertilizing.—The most rewarding work in tree maintenance is the simple procedure of fertilizing. Well-fed trees are least susceptible to the ravages of insect pests and disease. Certainly faster growth, darker green foliage in summer and more brilliant leaf color in autumn is worth the small effort required in tree feeding. Standard commercial fertilizers are excellent for trees. They are usually sold in granular form packed in 25-, 50-, and, most commonly, 80-pound bags. There are several different formulas represented by three numbers (example 10–10–10) which refer to per cent by weight of the three most important constituents—nitrogen, phosphorus, and potash in that order. For trees, formulas of 10–8–6 and 10–6–4 have been found to work best; but good results can be had with 10–10–10 and 8–8–8. Larger numbers in the formula indicate an increase in the strength of the fertilizer; therefore, less of the higher percentage fertilizer must be used or there will be danger of injuring the trees. Unless the gardener has a good understanding of the use of chemical fertilizers, it will be safer not to use formulas having numbers above 10 or 12. The procedure used in applying the fertilizer is simple. Using an iron bar approximately one inch in diameter and three to four feet long, sharpened to a point on one end (an old automobile axle is excellent) punch holes into the soil about 18–24 inches deep and 24 inches apart in a circle about the tree beneath the outer tips of the branches. A single circle of such holes is sufficient for trees having trunk diameters up to three and one-half inches. For larger trees, up to six inches in diameter, a double row of holes spaced 24 inches both ways will be necessary; and for trees ten inches or more in diameter, at least a triple row of such holes will be required. Pour a small handfull (about two tablespoons) of the fertilizer into each hole. If desired, the holes may be filled with soil or a mixture of peat or leaf mold and soil; however, if the soil appears compacted they may be filled with sand or pea-sized gravel which will permit water to soak quickly into the soil about the roots. Fertilizing of trees is best done in late February to the first of April. If there is not sufficient rain (at least 3/4 inch) soon after fertilizing, the soil should be soaked in order that the fertilizer be dissolved and distributed to where it can be taken up by the tree roots.

Pruning.—Through careful and thoughtful pruning of a young tree the gardener can control its branching pattern and correct many faulty growth habits that may lead to serious maintenance problems as the tree matures. Most trees are well trained when received from the nursery and need only enough pruning to balance the crown of the tree with the root system which has been reduced through digging the tree from the nursery row. Newly planted bare-root or balled-and-burlapped trees should have most of the limbs shortened approximately 1/3. Trees grown in cans will need little shortening of limbs because few of the roots are lost in moving. The young tree should be trained to a single straight trunk with side branches extending as nearly straight out from the trunk as the habit of the tree will permit. Trees with horizontal branches are most able to withstand strong winds and the weight of ice. Nearly every tree will require some pruning at one time or another during the year. Attention given to the young twig may prevent removing a large limb later on. A branch that rubs against another should be removed because the chafing that occurs during strong winds prevents the formation of bark and the limbs will easily decay. Most trees can be pruned at any season; a well-known exception is the maple, which should be pruned in the fall or early winter and not from mid-January through May, for the wounds will bleed freely during this time.

Insects and Spraying.—Most tree diseases are easily prevented by keeping trees healthy and growing vigorously. However, this will offer no security from insect attack although it will permit the tree to recover rapidly after serious ravaging by insects. Except for the wood-boring beetles, insects often find the leaves and rapidly growing succulent shoots of healthy trees a choice source of food. The insects that usually cause damage to shade trees are divided into four groups.

Borers often damage newly planted trees which are suffering from the shock of moving and are not making rapid growth. In a healthy tree the borer may be sealed into its burrow by the rapid growth of bark over the entry, causing the borer to suffocate. Borers may be located by the entry holes on the lower portion of the tree trunk. They are usually killed by squirting carbon bisulfide into the hole and sealing it with putty or wet clay. Spraying uninfected trees with a DDT emulsion is a good preventative for borers.

Chewing Insects cause serious damage to shade trees because they reduce the leaf surface area vital to healthy growth. The presence of chewing insects is indicated by the leaves having portions missing around the outer edge. Some chewing insects eat away the softer portions of the leaf leaving only the veins and stem. Stomach poison sprays such as arsenate of lead and DDT are good insecticides for chewing insects.

Sucking Insects, such as red spiders, aphids, thrips, and leaf-hoppers, often do more damage than chewing insects because being so very small they frequently go unnoticed until the vigor of the tree is greatly reduced. The gardener will do well to learn to recognize these and other common insect pests on trees. Sucking insects usually cause a malformation of the leaf or new shoot, or discoloration of the leaves. They are best controlled by the use of such contact sprays as nicotine sulphate, DDT, and sprays having pyrethrum or rotenone as the active ingredient.

Scale Insects, although sucking insects, are considered separately since they require special treatment. They are difficult for the novice to discover on trees for they are flattened and have much the same appearance as the bark. When present in quantity they may be scraped from the bark. They often give off a pungent odor when crushed. While scale insects are more easily seen in winter they continue their damage through many months of the year and should be treated before they get a head start. A dormant miscible oil spray applied in the winter months may be used.

Small trees, those 20 feet or less in height, may be easily sprayed using the standard 1½- to 3-gallon, hand-pumped, pressure spray tank. A nozzle that can be adjusted from a fine spray to a strong stream will enable one to reach both lower and upper branches of trees. The fine spray gives more thorough coverage of leaf surfaces and hence more complete insect control. It is important to spray the lower as well as the upper surfaces of all leaves. Power-driven spray equipment is necessary for the control of insects in large shade trees, and a qualified tree spraying specialist is recommended.

Once upon a time not so very far from here there was a beautiful garden wherein grew the most wonderful kinds of flowers and trees from all over the earth. It was a friendly old garden smack dab in the middle of a big city and no one could really remember when it first started to grow, but everyone liked to come through the garden gate and see all the beautiful things growing inside. On sunny afternoons folks would bring all the kids and relatives and everyone would have a good time in the wonderful garden.

Now it happened that as time went on the Garden needed more kinds of flowers and some more gardeners to take care of the flowers and some more people to tell all about the flowers to the people who asked what kinds they were, since folks were coming in from all over the land. And so it was that a happy group of people got together and called themselves friends of the garden. And the friends were friendly and potted up plants and worked hard and gave their money so the wonderful garden could keep on growing. And it grew and grew.

Now all that was many years ago, but even today the garden has friends and the friends are still helping the garden grow. And folks are still coming through the garden gate with all the kids and relatives and family dogs on Sunday afternoons and the sun is still shining and the grass is green and everything is coming up roses. It may even be that everything will grow happily ever after.

The moral of this tale is that, if you've got a garden and want to keep it growing, get yourself a group of Friends who can keep themselves going.

And that's just what the Friends have in mind with the Telephone Membership Drive beginning January 14 and running through February 8. This is a quiet reminder that many more volunteers are needed to help make calls if the drive is to be a hapily-ever-after sort of thing.

All telephoning will be done from the home of Mrs. Thomas Sayman, 5399 Lindell Boulevard. Calls will be made from 9:30 to 12:30 for the morning teams and from 12:30 to 3:30 for those who help in the afternoon. More than 200 volunteers are needed, since there will be 10 phones and they will be used Monday through Friday during the 4 weeks of the campaign. Each day's volunteers will serve on either a morning or afternoon team of 10, and as a slight incentive to the greater success of the drive, there will be prizes awarded to the team whose calls result in the most new memberships.

Friendly persons wishing to volunteer should return the postcard in last month's BULLETIN or else call the Friends Office at TO5-0440. Tell Mrs. Miller you want to help make everything come up roses.

SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 9:00 P. M. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.

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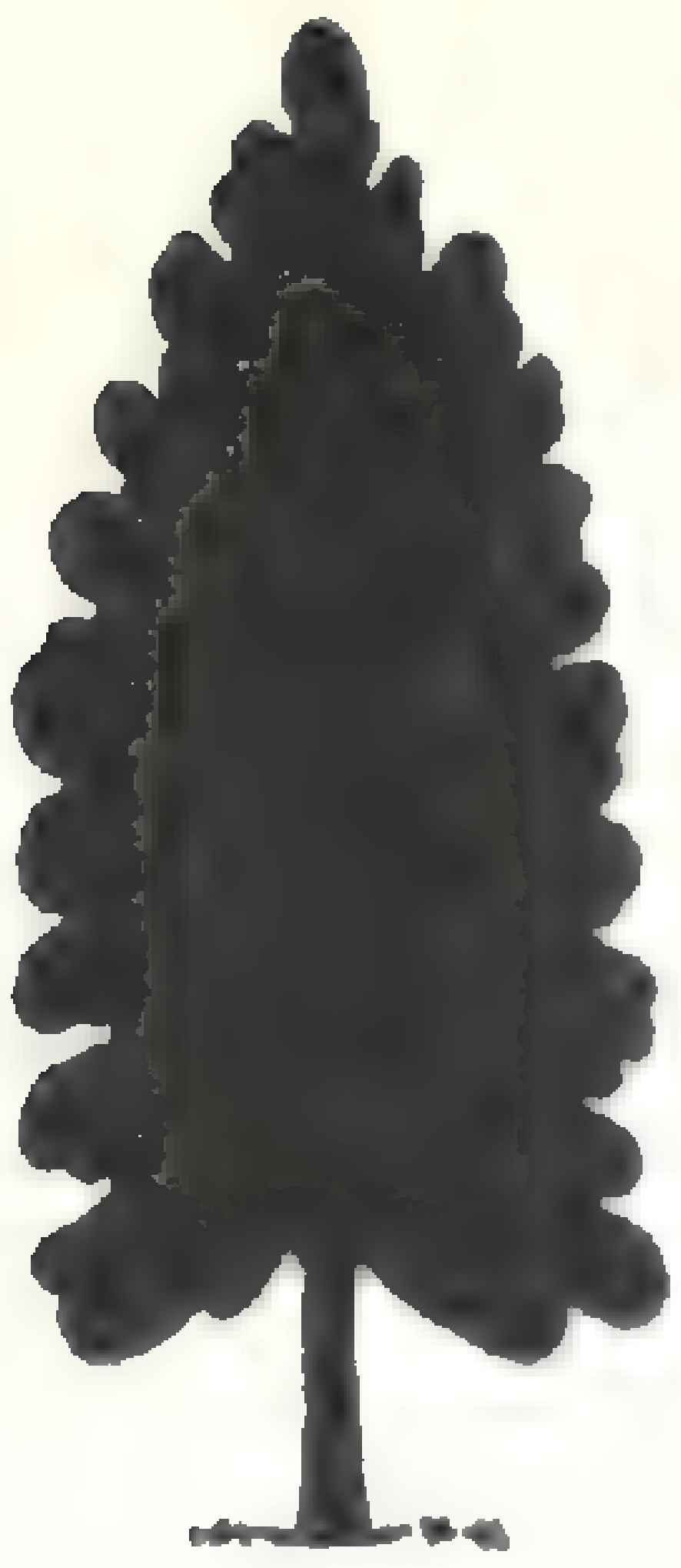
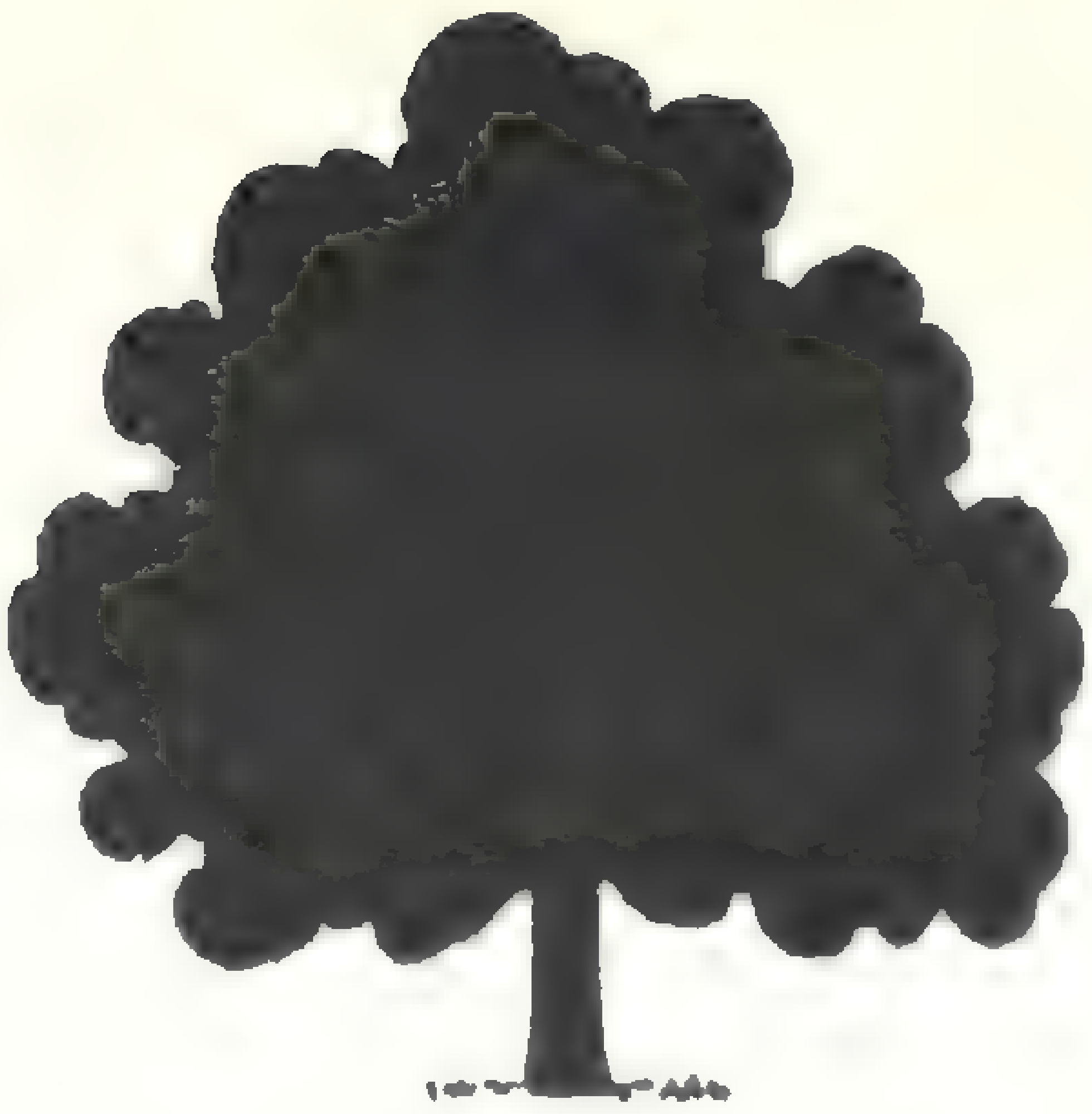
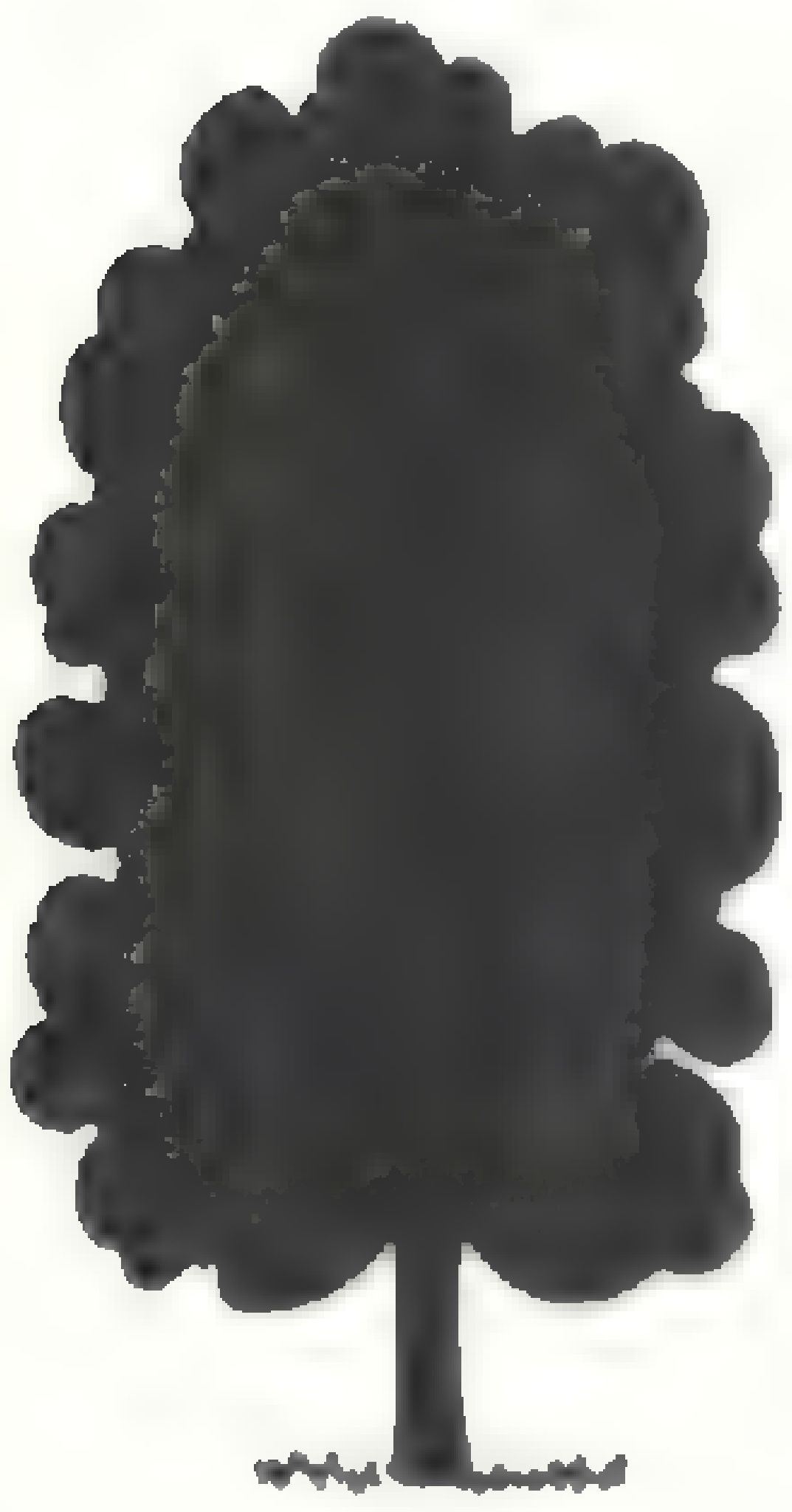


Pin Oak



White Oak

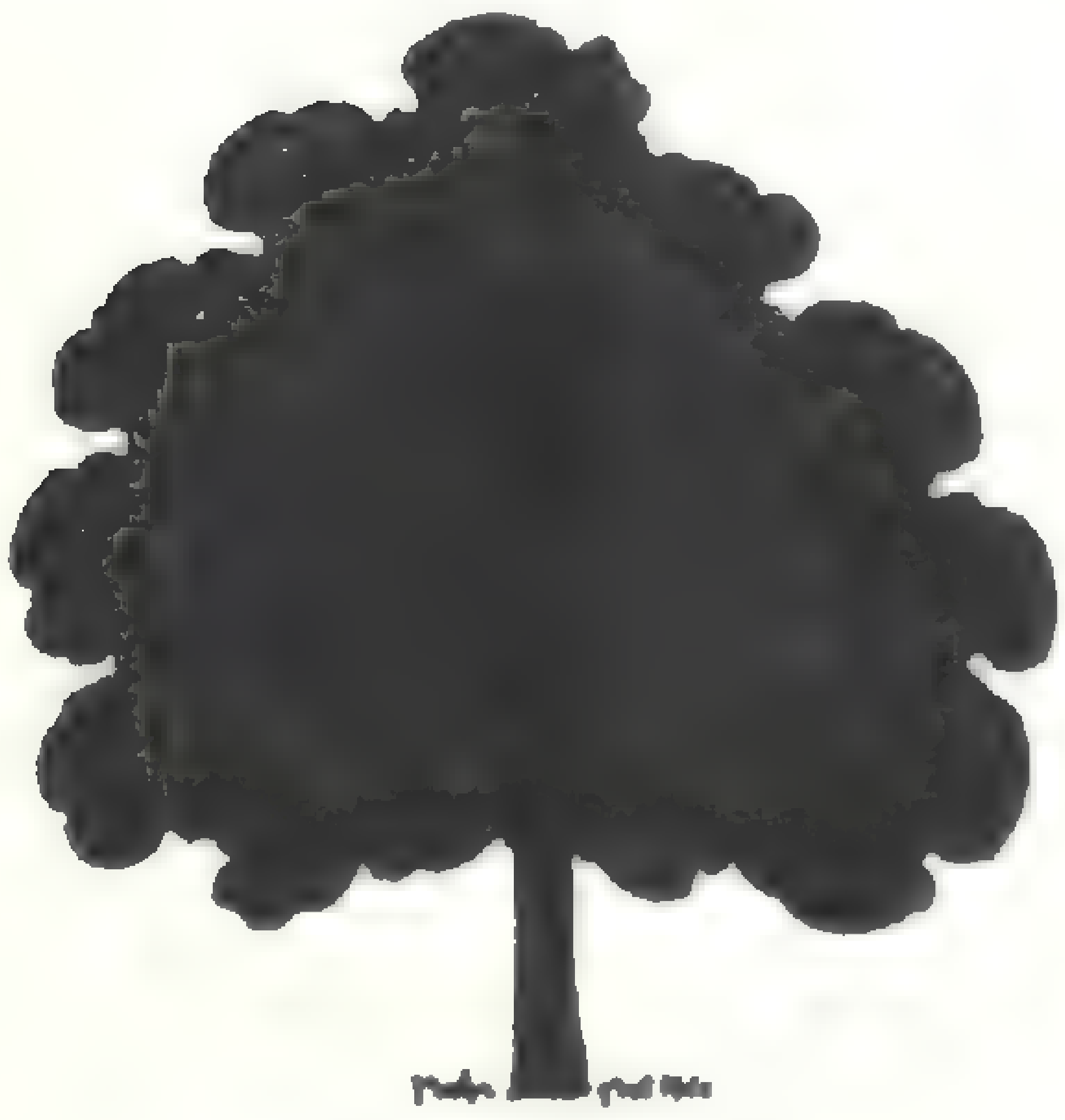
Norway Maple



Tuliptree

Sycamore

Sweetgum



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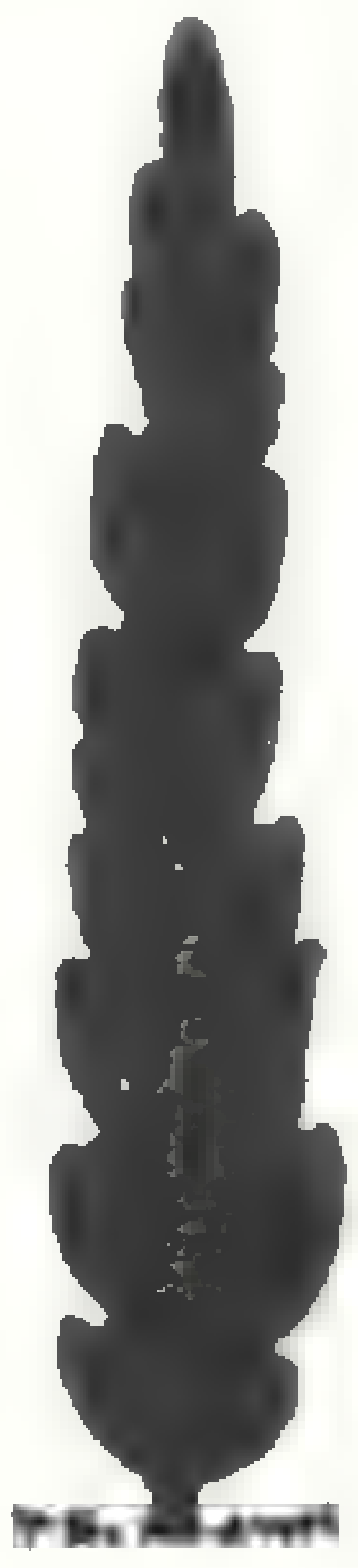

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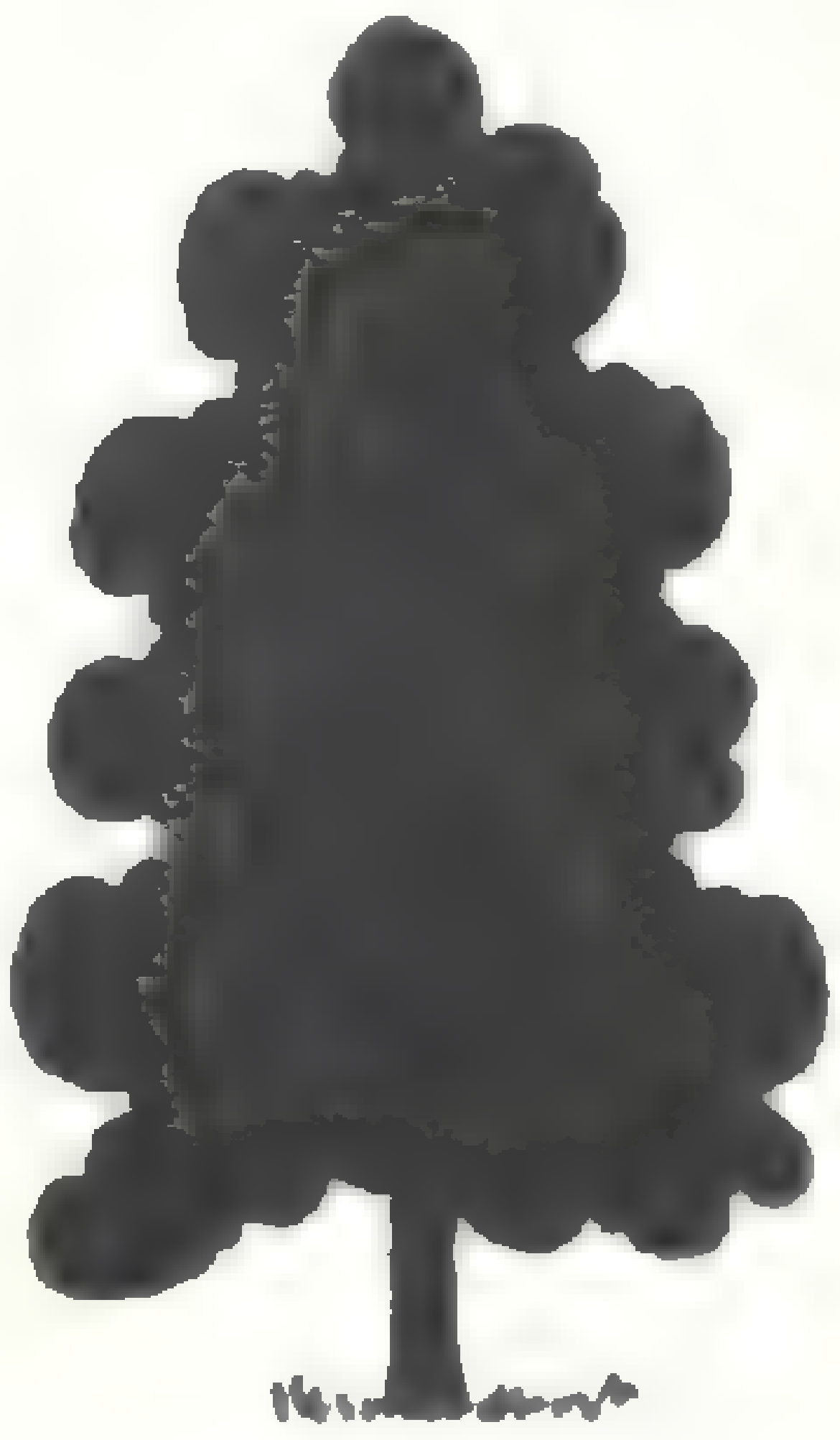
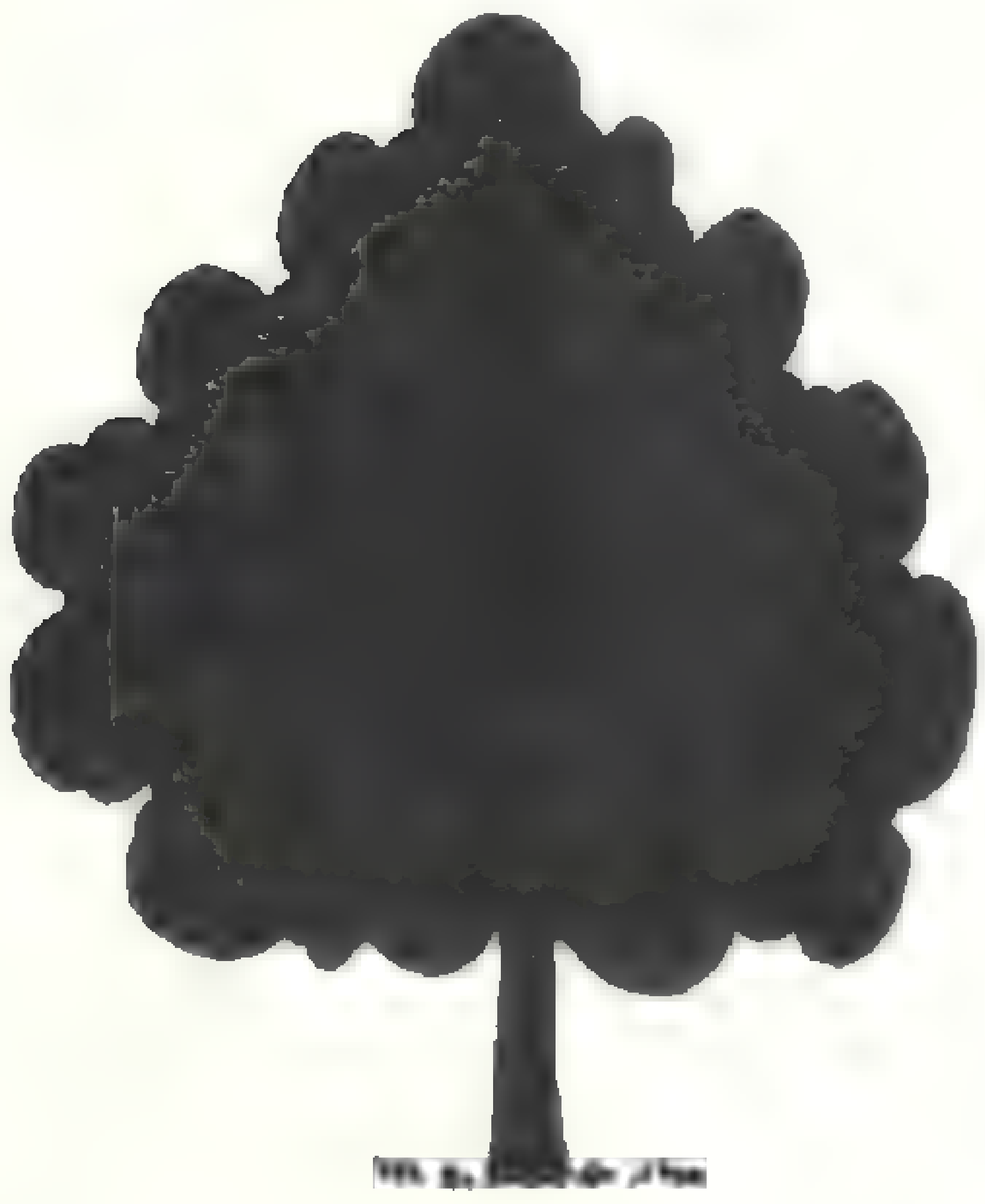


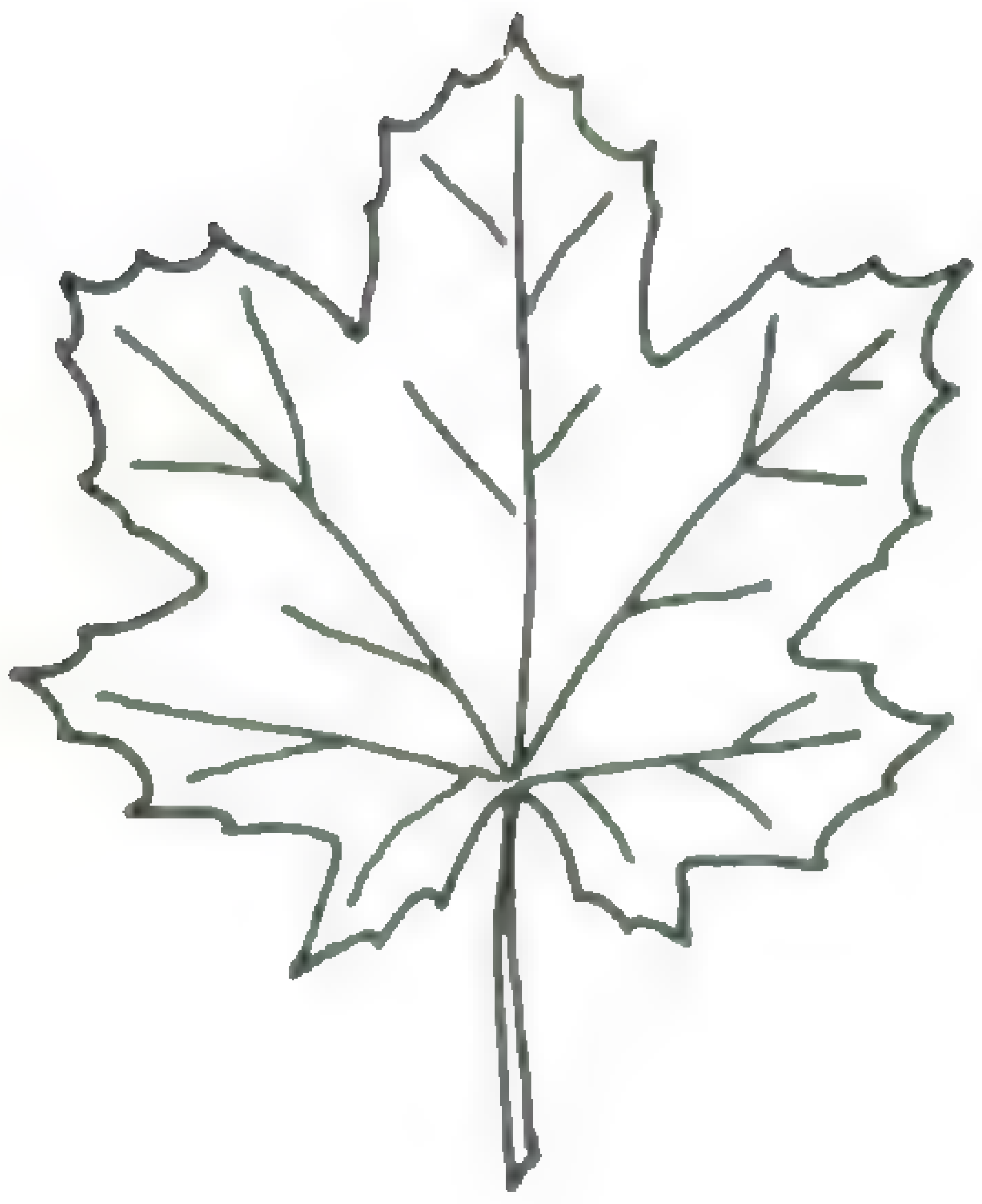
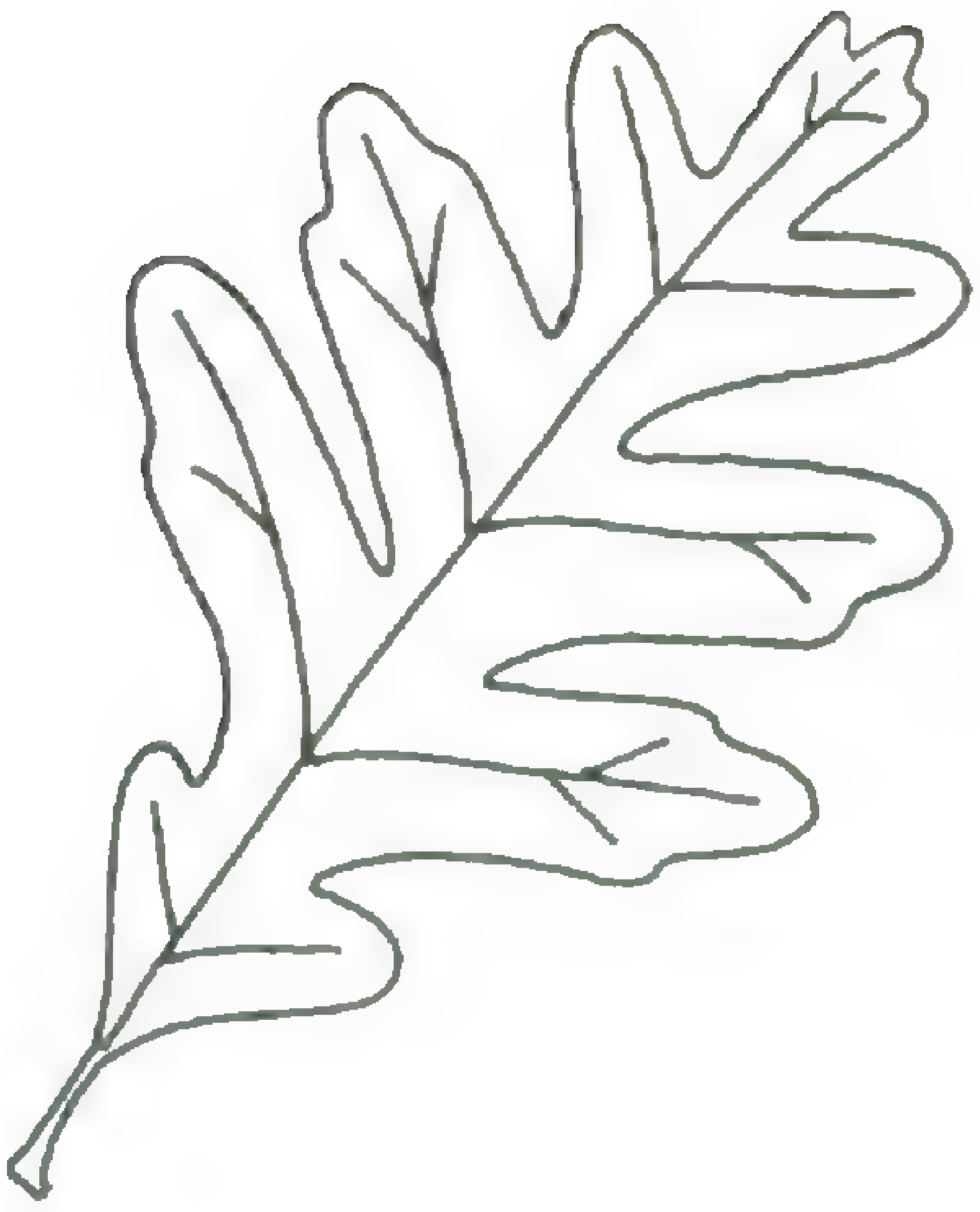
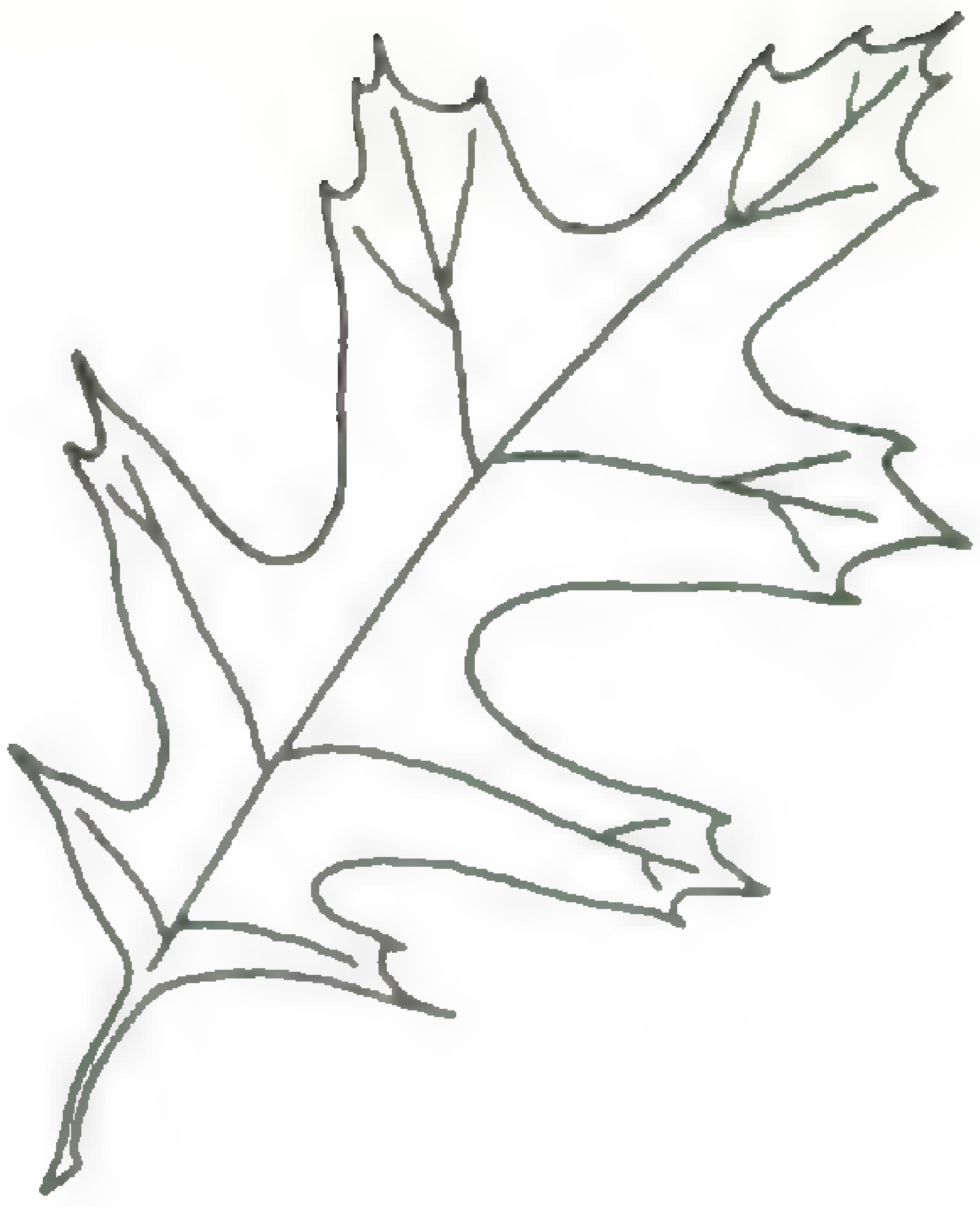
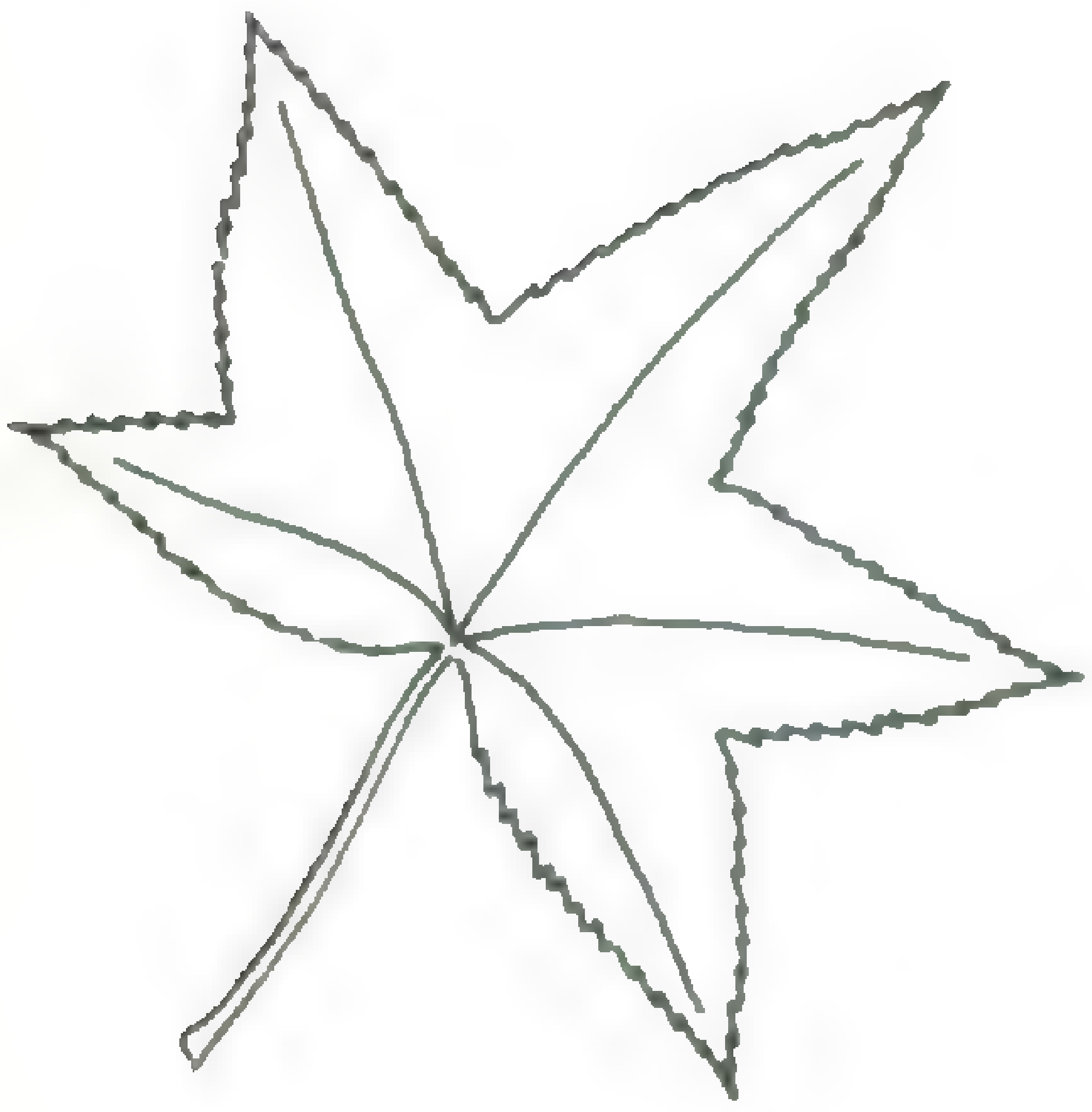
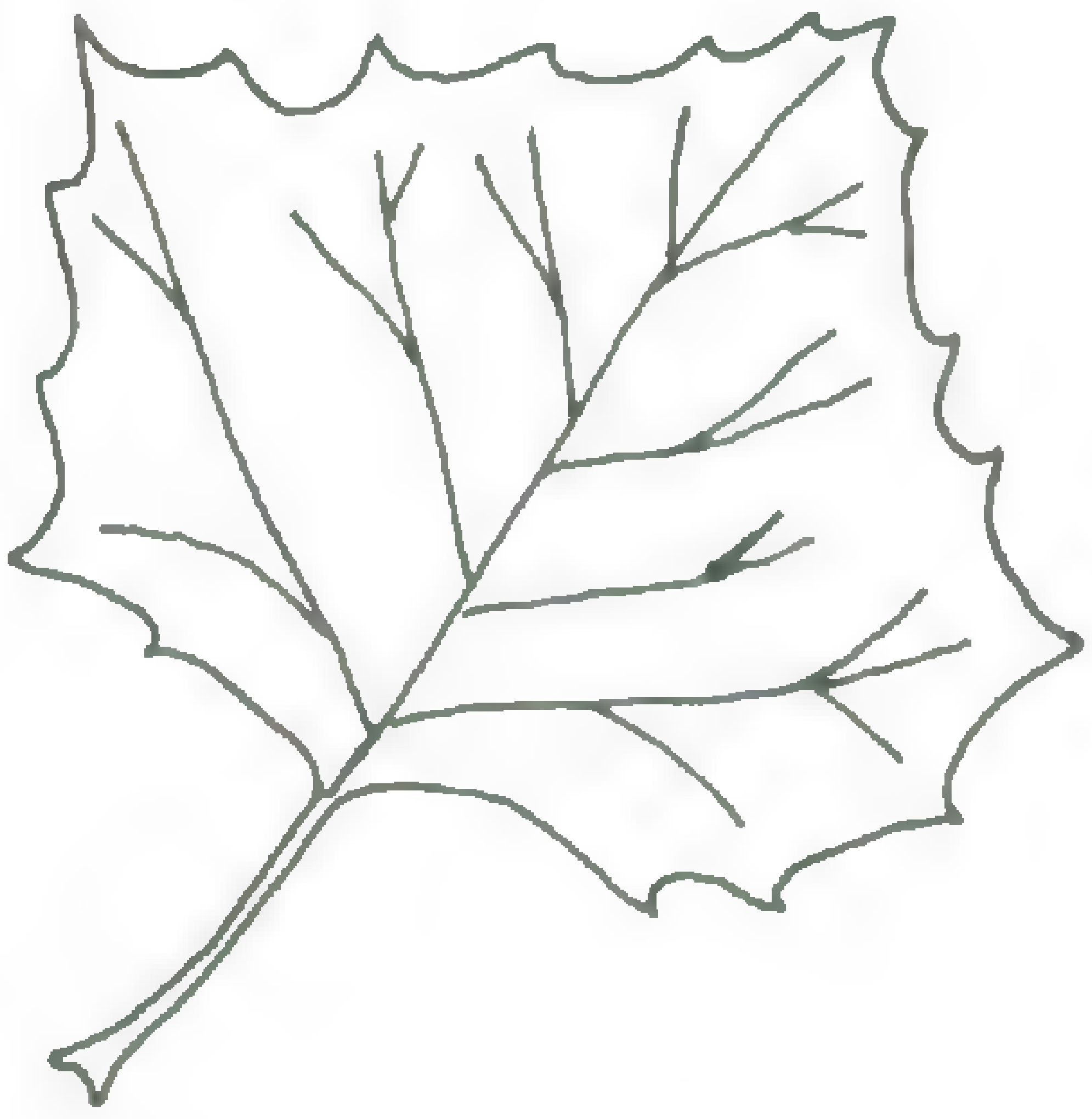
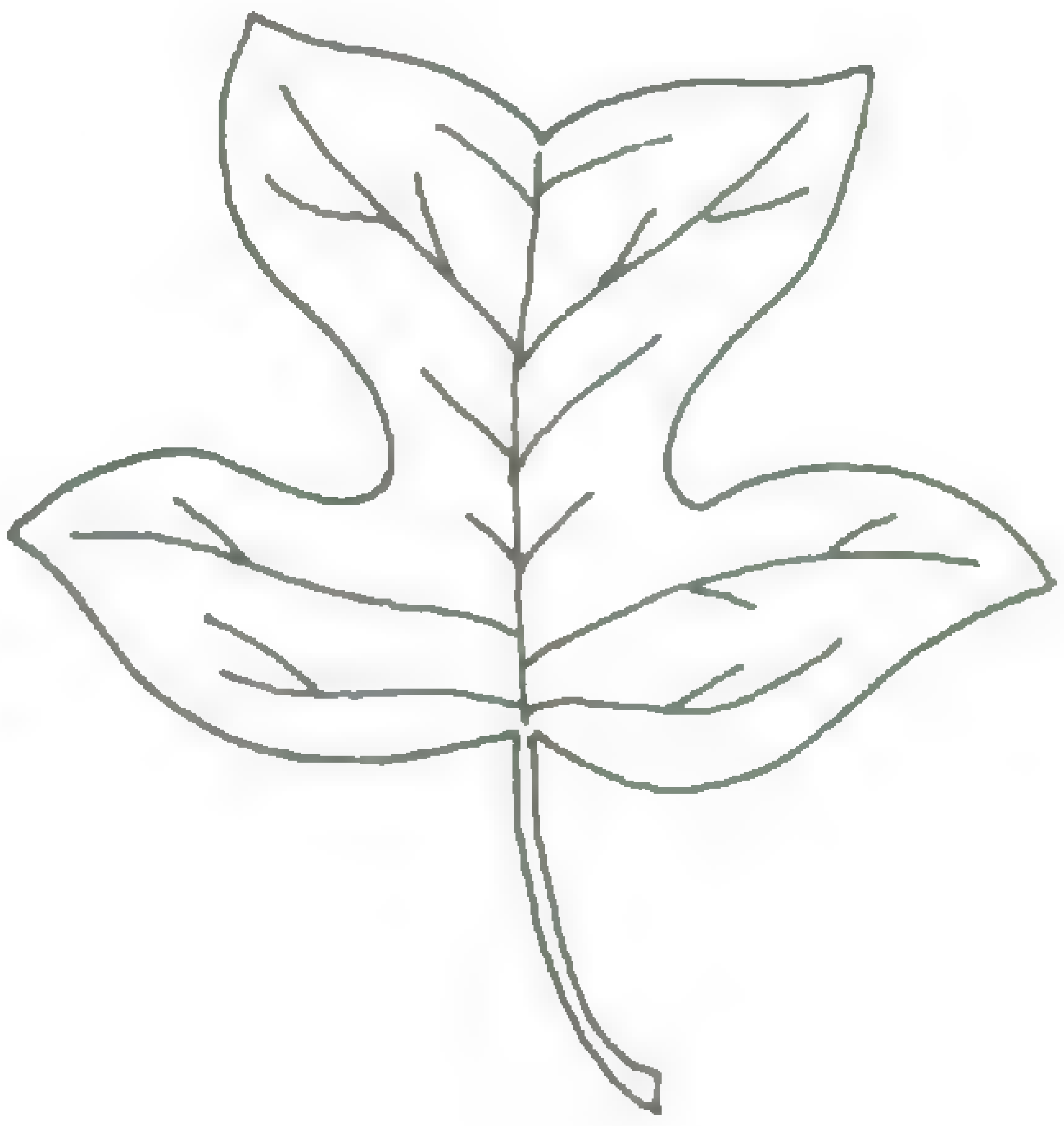
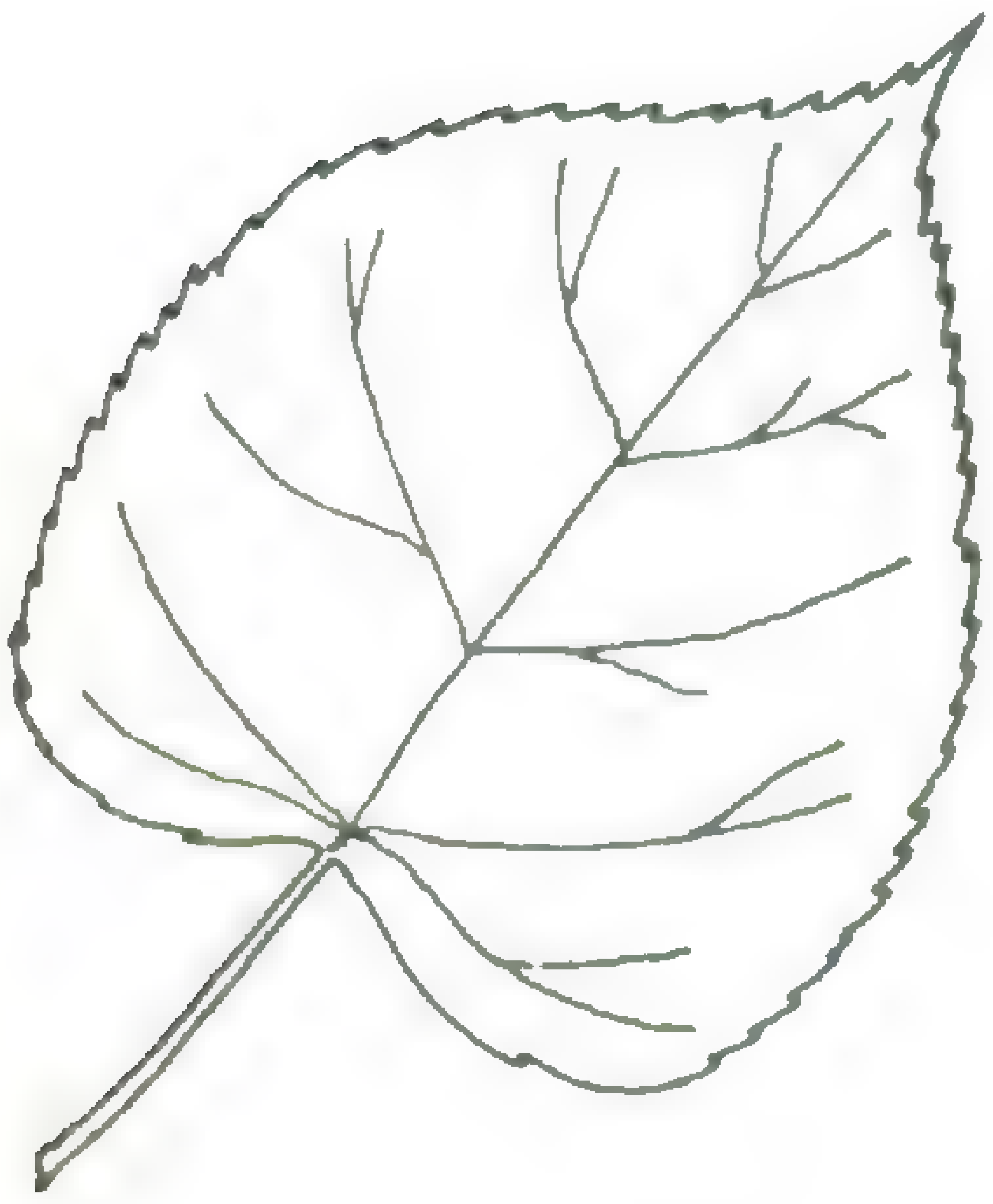
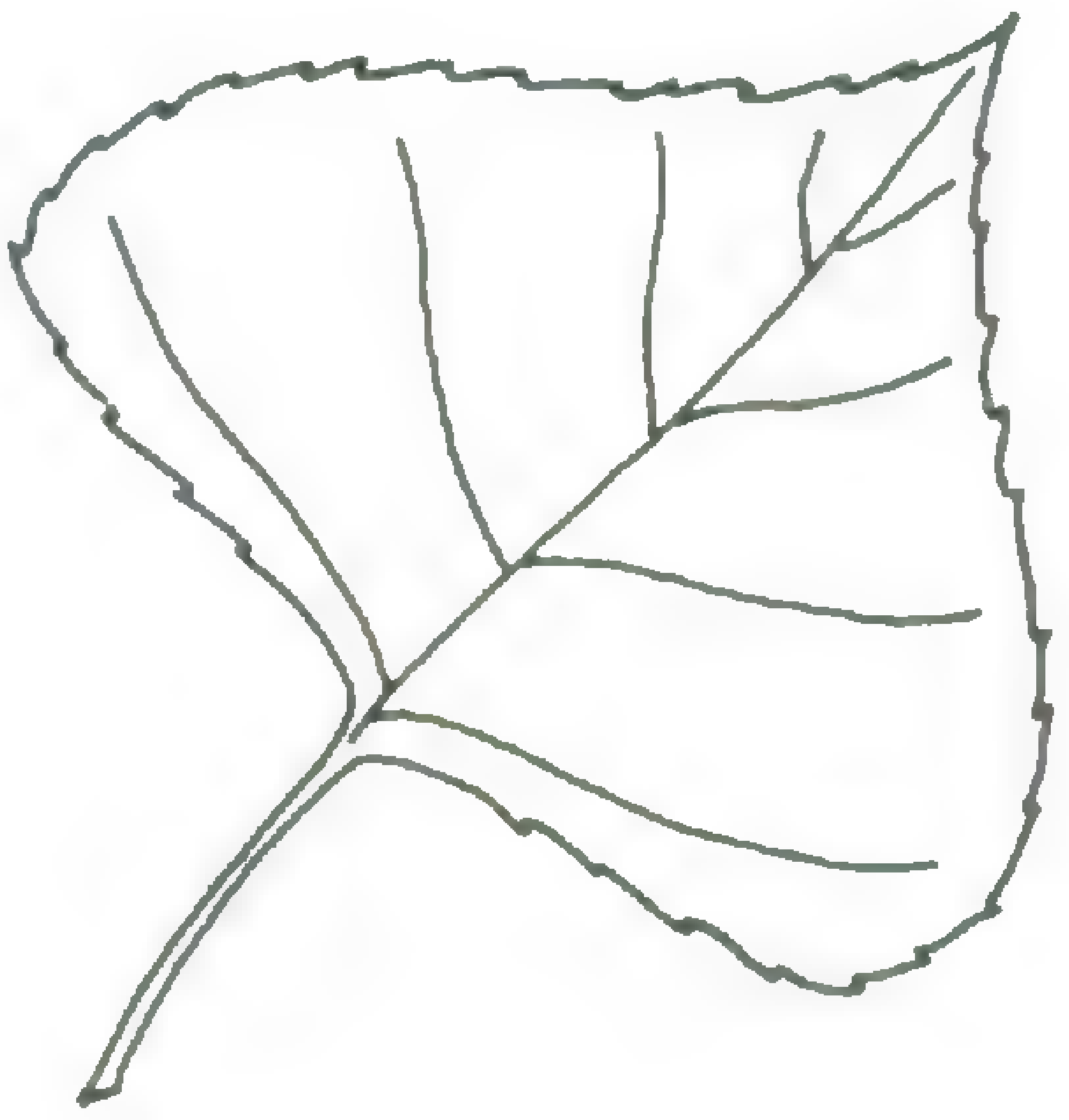
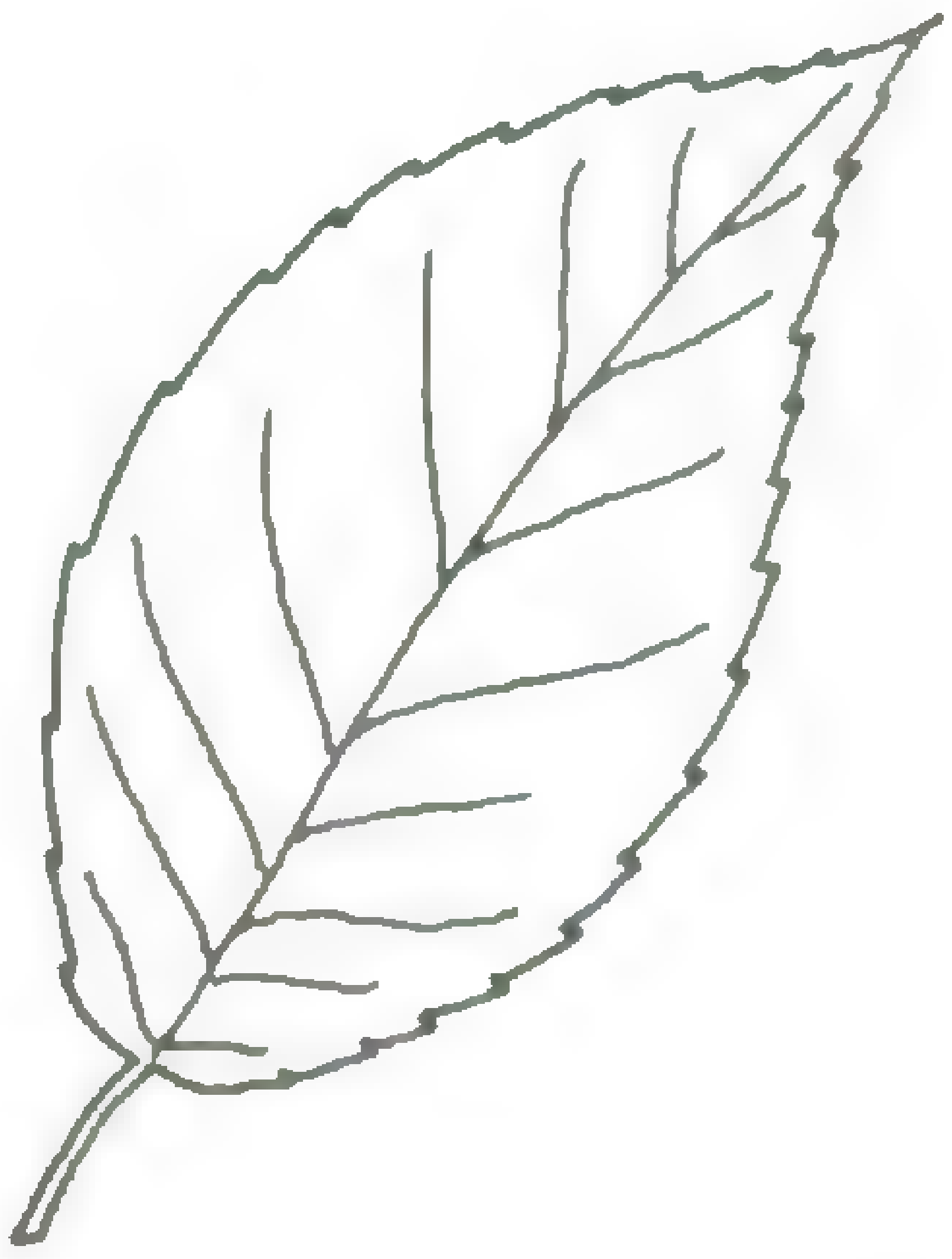
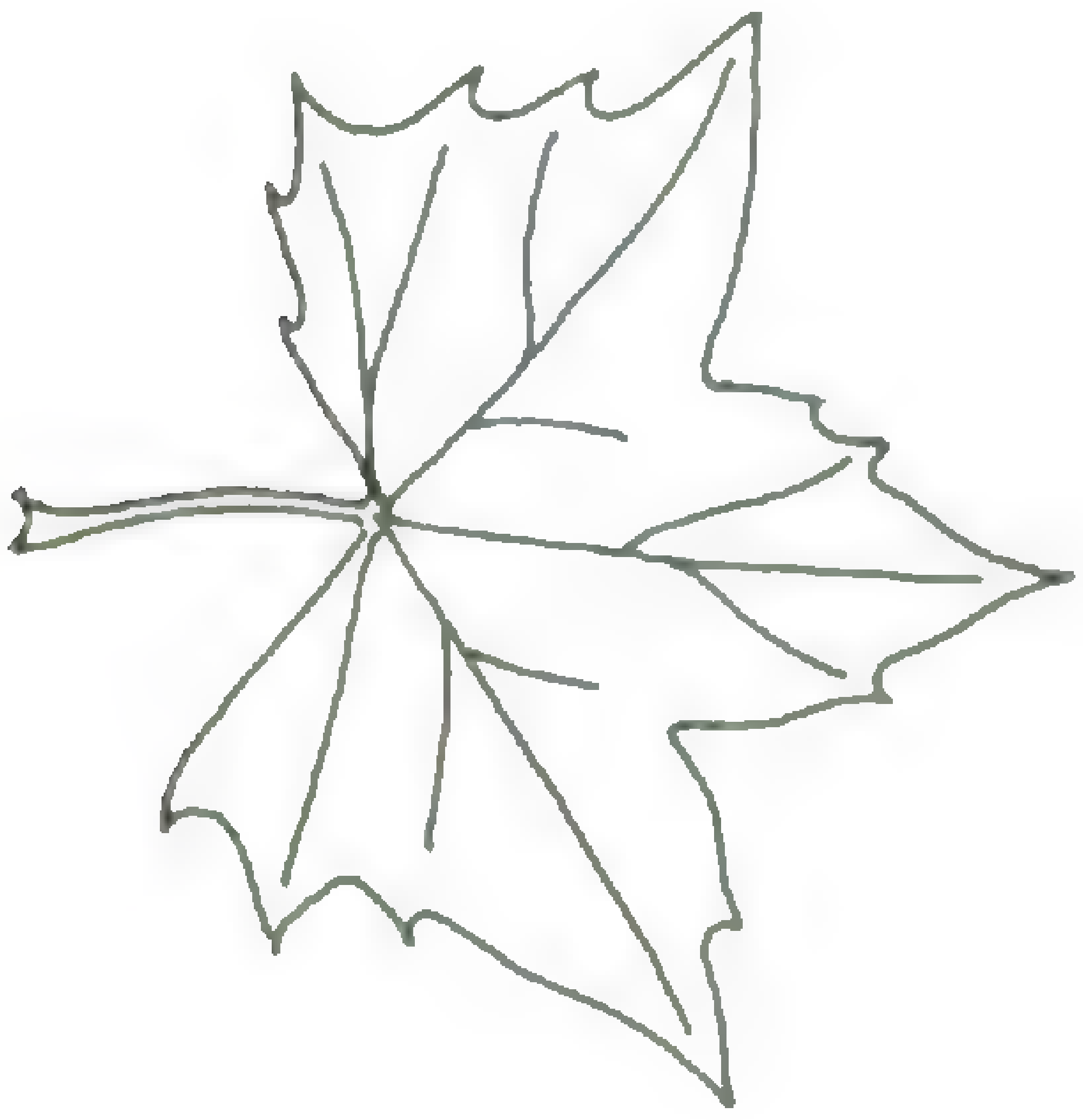
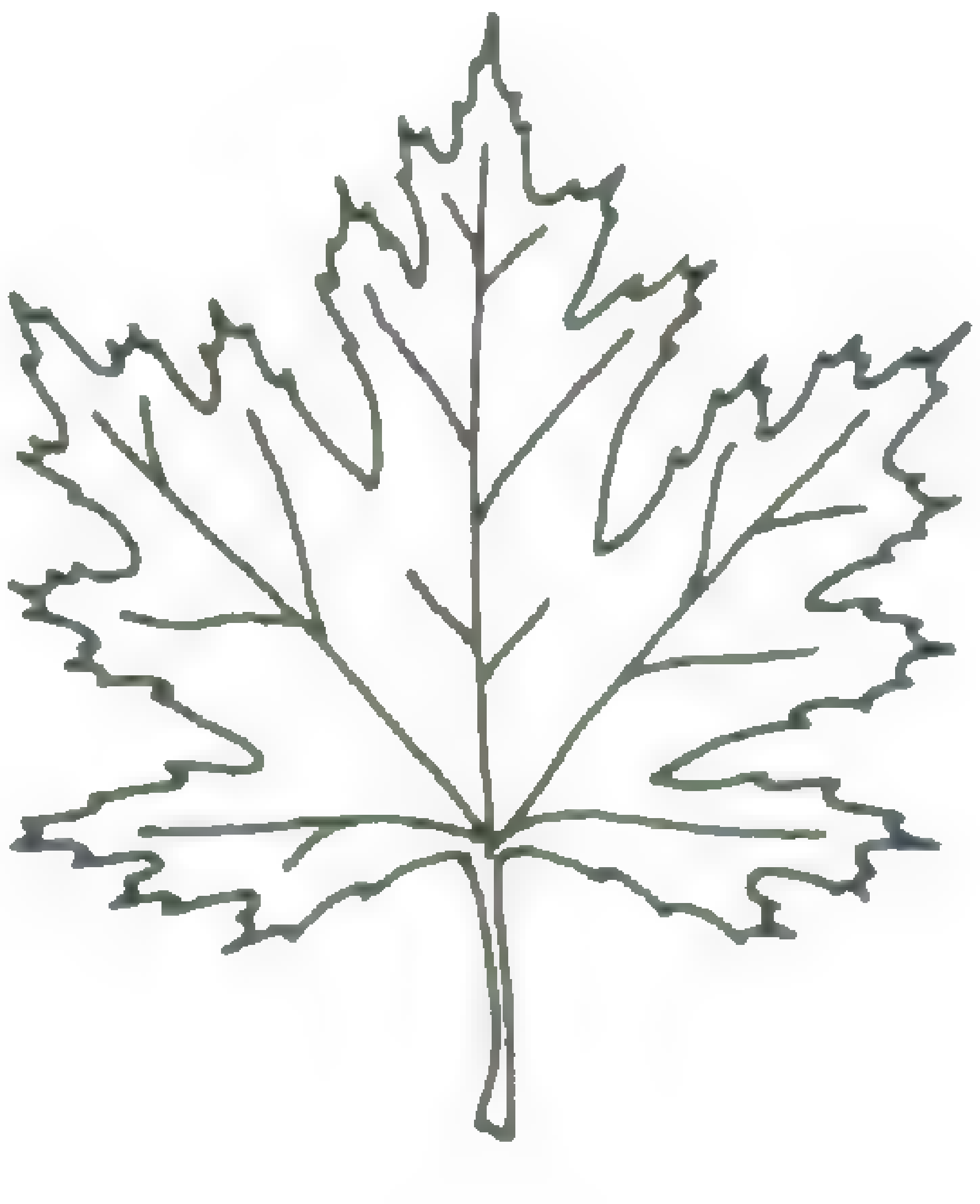
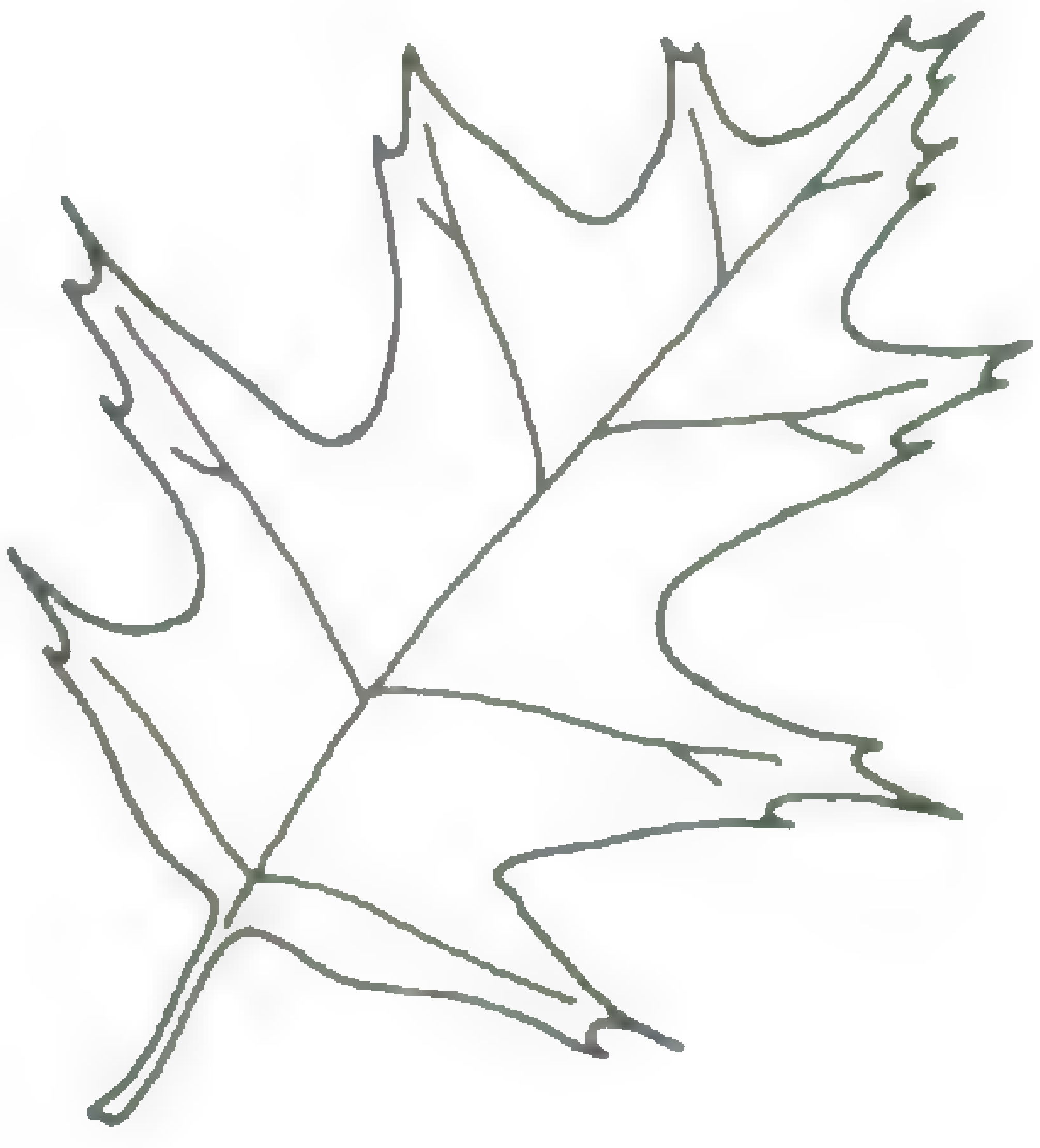
Linden



Northern Red Oak

Silver Maple

London Planetree

MISSOURI BOTANICAL GARDEN

Bulletin

December 1962
Volume L
Number 10

Cover: A carpenter ant obtaining honeydew from the nymphs of the treehopper, *Entylia sinuata.* PHOTO FROM U. S. DEPARTMENT OF AGRICULTURE

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CONTENTS

Review of *Silent Spring*

Educational Programs 1963

Garden Gift Store

◆

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: Brian Gordon.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Vol. L No. 10 December 1962

REVIEW OF *SILENT SPRING*

F. W. WENT

VERY few books dealing with scientific problems or technical information become best-sellers. But Rachel Carson has already scored twice in this field: first with the delightful *The Sea Around Us*, and now with the frightening *Silent Spring*. Part of her success as a writer is her fluent language, appropriate and alluring adjectives, catching phrases (with as best example the title of her book), and her unquestioned mastery of her subject.

With her latest book, *Silent Spring*, she enters the missionary field, and enters it with explosive effect. This book is very timely, and if properly heeded may do a lot of good by exposing the very real dangers of the indiscriminate and careless use of powerful poisons in our fight against weeds, insects and diseases. I, personally, and also as a spokesman for a large number of biologists and scientists, am glad that this book has been written, and I hope that it will have a real impact, and will not be forgotten after its newness has worn off.

In the first short introduction, Miss Carson paints a picture of what might happen if insecticides and herbicides were used without any restraint and without any respect for other organisms or the balance of nature. This is a frightening picture, but our experience tells us that it is entirely possible, though not probable. In the following chapter she describes how man has become the master of the molecule and the atom and how this brings with it grave dangers. It seems, however, that here she is overstating her case. For instance, the work of the atomic scientist is called "tampering with the atom." I hardly believe that this is fair to the physicist and chemist, who are not tampering but who are able, on the basis of deep theoretical insight, to guide the fate of the atom. In a similar way she talks about chemicals "brewed in the scientists' laboratories," implying a non-existing relationship to the old alchemists whose activities were very often described as brewing and who hardly knew what they were doing. Many other examples could be given where through the skillful use of words a slightly unfavorable slant is given to the activities of scientists. Another example of this tendency to overstate is her discussion of DDT. After it was found that flies and other insects can adapt themselves so that they tolerate DDT, it became necessary to find other *different* chemicals to which the flies were not adapted.

Silent Spring, by Rachel Carson, Houghton Mifflin Company, Boston, The Riverside Press, Cambridge, 1962.

She calls this a search for deadlier and deadlier poisons, which is, strictly speaking, not correct. DDT was originally very deadly and the new poisons must be deadly too but in a different way.

Among the important reasons for vastly increased dangers of pests and diseases, she mentions the intensification of agriculture and the immensely increased acreages of single crops. She also stresses that so many organisms, when transported in new environments, may not be subject to "restraining hands of the natural enemies that kept down their numbers in their native lands." She cites the Dutch elm disease as a specific example of a new disease which was so effective because of the increased planting of elm trees in our cities. However, the chestnut blight has already destroyed, and the oak wilt is in the process of destroying, our native chestnuts and oaks even where man has not influenced the environment in any way, which indicates that occasionally disease may erupt and destroy even within a balanced nature.

After these introductory chapters, she discusses a succession of poisonous chemicals, with DDT leading the procession. These are excellent reviews of the chemical, toxicological, and use problems of these chemicals. She then continues to discuss the price of using these chemicals in an indiscriminate way, as in the death of large numbers of birds and in the possible dangers to human life. However, we have to realize that in spite of the increased dangers of poisonous chemicals, the human life span has been increasing rapidly for the last century and continues to increase, largely because of the control of infectious diseases, their insect vectors, sanitation, and many other processes possible only because of the use of powerful chemicals. We have to realize that misuse of chemical sprays, of which so many instances are quoted by Miss Carson (e.g., roadside spraying with weed-killers), is not an indictment against the chemicals, but against their faulty application. Almost every biologist, agriculturist or forester can multiply the examples of misuse. A particularly inane case occurred in the Southern California mountains. These are very steep in many places, and among the difficulties in road building are eroding road banks and fill slopes. They can be anchored by expensive structures and by equally expensive plantings. In many places pines had been planted to hold the road slopes, and after years of loving care and regular watering, they had become established as beautiful young trees. One good spraying with a weed killer along the roadside was as destructive as a fire and killed the trees together with the so desirable shrubs. Ironically, along the mountain road there were hardly any weeds which needed removing.

To sum up: Miss Carson, in a powerful, well documented, and convincing way, has exposed the very real dangers of man becoming an unwitting victim of forces he has unleashed without fully realizing their implications. A further example of the dangers of not fully tested chemicals is thalidomide, the tranquilizer drug which may cause the birth of malformed babies. This drug was fortunately kept out of

American drugstores by the courageous application of the provisions of our Pure Food and Drug Act. This case, culminated by the award of the Distinguished Federal Civilian Service Medal to Dr. Frances Kelsey, broke after *Silent Spring* was written. Whereas thalidomide exemplifies the potential dangers of drugs, it also indicates that here in the United States we have laws which, if properly enforced, protect the public from misuse of the vast numbers of chemicals which are yearly synthesized by chemists.

If we were not already impressed by the missionary zeal (and effectiveness) of women, as, for example, in the League of Women Voters, women like Miss Carson, joined by Dr. Frances Kelsey, Dr. Barbara Moulton and Dr. Helen Taussig, following in the footsteps of Harriet Beecher Stowe, would convince us of the importance of women not only to keep watch over our liberties, but to campaign for them very effectively.

To be effective as a campaigner, and to overcome the innate human conservatism or indifference to problems which do not concern the individual directly or immediately, it is necessary perhaps not so much to overstate a problem, but rather to emphasize one side. This Miss Carson has done. The other side of the problem of chemical control of pests and diseases is mentioned by Miss Carson repeatedly, but one would hardly gain from her book a proper perspective of the vital role of insecticides, pesticides, and fungicides in our present-day society.

Many of us, Miss Carson included, consider man as part of nature, and therefore we object to his interference with nature. As a matter of fact, this attitude is incorrect. As long as man competed with animals on their own terms he belonged within the balance of nature. But when man started to use clubs, axes and spears, or even bow and arrows, he extended his arms beyond what he and all other animals had been endowed with by nature. Then the use of fire, metals, and finally chemicals, electricity, and atomic power, placed man far beyond nature and outside natural phenomena. Any men living on roots they have to dig, fruits they have to pick, or game they have to hunt, can exist only in very limited numbers, say at most one man per square mile (in very productive areas). This limited the human population of the earth, before spear and arrow, to a few million, comparable with the bear or lion population of the earth.

Once man started to manipulate phenomena he was able to beat natural laws. He upset the balance of nature, and could increase in numbers far beyond what the natural laws of ecological equilibrium allow. Actually, at present the world population is about 1000 times greater than it possibly could have been if man had stayed a part of nature. This also makes it clear that man cannot possibly go back to nature. Fungicides, insecticides, herbicides, and so many other potentially harmful chemicals are here to stay, whether we like them or not. We have to learn how to live with them or lose the battle against nature.

In her last chapter Miss Carson indicates that chemicals are not the only way in which weeds, pests and diseases can be combated. Or, rather, she indicates that the other way, using ecological or natural methods of control, is the only proper way. Personally, I agree with her that if there is an alternate road to pest control, using nature's own way, this is preferable. But in so many cases there is no alternate road. And naturally occurring methods may be as disastrous to human health as the use of synthetic chemicals. The number of cases in which hydrocyanic acid is present or produced in plants is remarkably large. Many of our food plants such as cassava *(Manihot)* and sago *(Metrosideros)* are deadly poisons until their cyanogenic glucosides have been removed. The plants perhaps contain these poisons to protect them from being eaten by animals less sophisticated than man. Then there are the opium poppy, the plants containing strychnin, arrow poisons, cocaine. And many luguminous plants cause cattle poisoning (as the name loco-weed, e.g., indicates).

If there is an ecological way of keeping insects, fungi, and weeds under control this is preferable, or sometimes it is the only way. Barberry elimination, for example, has greatly reduced the incidence of wheat rust, and together with the continued breeding program for rust resistance, wheat production remains high and wheat is still the major staple food. Any relaxation of the control or breeding program would result in wheat crop failures within 5 to 10 years.

Another example of biological control was developed by a friend of mine in Java. Years ago wooly aphids became a terrible plague in sugar cane fields and no amount of spraying with the old rather ineffective or too expensive insecticides did any good. Newly planted fields soon became infected in an uncontrollable way. Dr. Hazelhoff found that the insecticides not only killed many aphids, but also most of the wasps which parasitize the aphids and in nature keep them within bounds. Therefore he suggested an ecological method of control: in a newly planted sugar cane field some aphid-infected stalks from an old *un*-sprayed field were tied to the young shoots. Both the aphids *and* their wasp parasites moved to the young plants, and the aphids did not have a chance to multiply beyond the number which the biological equilibrium between wasp and aphid would allow.

As long as man lived in very small family groups, he was not much of a menace to other creatures in his environment. It was only after he associated with other family groups that he became a social animal and became a threat to other animals. Man started to hunt in packs, and through his social organization could defend himself better against enemies and also could develop ingenious ways to best nature. In nature it is also the socially organized animals which are the greatest threat to man: wolves, rats, and ants.

It is very difficult to assess the value of present-day insecticides for our agriculture. The reason for this difficulty is that at the present time practically no agriculture is carried out without insecticides, fungicides, etc.,

(Continued on page 9)

EDUCATIONAL PROGRAMS 1963

MISSOURI BOTANICAL GARDEN

ACTIVITIES FOR CHILDREN

SATURDAY NATURE PROGRAMS FOR CHILDREN

NATURE study programs are provided every morning from 10 to 11:30 A. M. in the Museum Building and greenhouses for children ages 7 to 16. The programs are free and no advance registration is required.

Children are given instruction in the world of plants and their association with man, animals, birds and insects. They are encouraged to make collections. They plant seeds and bulbs, make cuttings of plants, and work in their own outdoor flower and vegetable plots. These programs offer children action, recreation, and the fun of taking home their collections, seedlings, bulbs, and produce from the garden plots.

For more information, call TO 5-0440.

PITZMAN SUMMER NATURE STUDY COURSES

A free summer nature program for children between the ages of 7 and 16 is made possible by a grant from the Pitzman Foundation. Children have a fundamental curiosity about everything going on around them, and these summer courses encourage this interest in living things by bringing children into closer contact with nature and answering the many questions that arise from such an experience.

The program is held on Tuesdays and Thursdays from 10 A. M. to 3 P. M. for 2 sessions of 5 weeks each. Junior and Senior Research Teams comprised of children interested in doing special natural science projects will meet on Wednesdays and Fridays under the direction of the Garden staff.

Registration for the first session will begin June 1st and for the second session July 1st. For information about the courses and registration, visit the Main Gate Office or telephone TO 5-0440.

COURSES FOR ADULTS IN HOME GARDENING

The Garden offers courses in gardening for all interested persons. Fees charged for the adult courses include all materials. Most classes and practice sessions will be held in the Garden's Experimental Greenhouse, which can be reached by entering the Cleveland and Tower Grove Avenue gate.

Registration for all courses must be made in advance, since the number of persons who can be accepted for a given course is limited. Should interest warrant, second sessions will be considered and should less than fifteen persons register for any course, it may be dropped, in which case the fees will be refunded.

All courses will be taught by Garden staff members and by selected specialists. Fees are based on the amount of time and materials supplied by the Garden.

HOME GARDEN PREVIEW—A Basic Course

For the home owner, a non-technical basic course including facts and procedures for planning, planting, pruning, fertilizing, watering and general maintenance of home grounds.

8 Sessions — Fee $10.00 **Experimental Greenhouse**
Tuesday evenings — 8 to 9:30 P. M. **February 5, 12, 19, 26**
March 5, 12, 19, 26

Instructor: Mr. Robert J. Gillespie

HOW TO PROPAGATE FROM SEED

Fundamental facts and procedures for producing annuals, biennials and some perennials from seed for use in your garden. The Garden supplies seed, germinating media and soil for four metal flats of seedlings which may be taken home. Persons wishing to supply their own seed must bring it to the first session.

5 Sessions — Fee $12.00 **Experimental Greenhouse**
Tuesday afternoons — 1 to 2:30 P. M. **March 12, 19, April 2, 9, 16**
Thursday evenings — 8 to 9:30 P. M. **March 14, 21, April 4, 11, 18**

Instructors: Mr. Clarence Barbre
Mr. Kenneth Peck

PREPARATION AND CARE OF LAWNS

Instruction on kinds of grasses and weeds and how to identify and control them. Preparation of ground for lawn establishment, soil conditioning, fertilizers and their application, rebuilding old lawns, maintenance and equipment will be discussed. Special attention will be given to individual problems.

3 Sessions — Fee $6.00 **Museum Building**
Section #1 Thursday evenings — 7 to 9 P. M. March 28, April 11, 18
Section #2 Tuesday evenings 7 to 9 P. M. April 9, 16, 23
Section #3 Tuesday evenings — 7 to 9 P. M. August 13, 20, 27

Instructor: Mr. Raymond Freeborg

HOME ORCHID CULTURE

Orchids suitable for home culture and best ways of growing them. Potting demonstrations and practice. Students may take home the plant they pot.

1 Session — Fee $10.00	**Orchid Greenhouse**
Saturday — 10 A. M. to 3 P. M.	**April 6**

Instructor: Mr. Robert J. Gillespie

BULBS, INDOOR — OUTDOOR

Instruction on bulb forcing and outdoor bulb culture. The Garden will supply each student with 24 top quality bulbs in 7 inch clay pans which may be taken home. The Garden will also provide space for cool treatment which the forced bulbs require. A practical and timely course for October.

2 Sessions —— Fee $8.00	**Experimental Greenhouse**
Tuesday evenings — 8 to 9:30 P. M.	**October 1, 8**
Thursday afternoons 1 to 2:30 P. M.	**October 3, 10**

Instructors: Mr. Clarence Barbre
Mr. Kenneth Peck

HOW TO PROPAGATE FROM CUTTINGS

Fundamental facts and procedures of producing trees, shrubs and perennials from cuttings (asexual reproduction). The Garden will supply a plastic covered metal propagating flat, media and plant materials for 40 to 50 kinds of plants. Student practice will emphasize propagation of house plants such as begonias, dieffenbachias, and philodendrons. Some attention will also be given to hardwood cuttings. The following methods of vegetative propagation will be used: root cuttings, suckers, divisions, hard and softwood stem divisions, hard and softwood stem cuttings, leaf, bud and scale cuttings.

5 Sessions — Fee $12.00	**Experimental Greenhouse**
Tuesday evenings — 8 to 9:30 P. M.	**October 15, 22, 29, November 5, 12**
Thursday afternoons — 1 to 2:30 P. M.	**October 17, 24, 31, November 7, 14**

Instructors: Mr. Clarence Barbre
Mr. Kenneth Peck.

PLANTS UNDER ARTIFICIAL LIGHT

Latest up to date thoughts and practices on the use of artificial light for plant propagation and culture, illustrated with practical equipment for the amateur or professional grower.

2 Sessions — Fee $5.00	**Orchid Greenhouse**
Thursday evenings — 8 to 9:30 P. M.	**October 17, 24**

Instructor: Mr. Robert J. Gillespie

LECTURES AND TOURS

FIRST MONDAY LECTURES

On the first Monday of the month a free lecture is given at 8 P. M. in the Museum Building of the Garden. The speakers are usually members of the Garden staff telling about some interesting phase of research work at the Garden or on field trips. Most of these talks are illustrated with colored slides.

February 4 —	Dr. Frits W. Went, Director, Missouri Botanical Garden. "A Botanist's Travels in Australia and New Guinea."
March 4 —	Dr. Henry N. Andrews, Dean of the Henry Shaw School of Botany, Washington University, and Paleobotanist for the Garden. "A Botanical Expedition to an Arctic Island, Ellsmere Island."
April 1 —	Miss Edith S. Mason, Landscape Architect, Missouri Botanical Garden. "Ideas for St. Louis Gardens."
May 6 —	Dr. Norton H. Nickerson, Morphologist, Missouri Botanical Garden. "A Research Summer on Cape Cod." Dr. Owen J. Sexton, Research Ecologist, Missouri Botanical Garden. "An Indian Village in Panama."
June 3 —	Mr. Ladislaus Cutak, Greenhouse Superintendent, Missouri Botanical Garden. "A Plant Collector in the Caribbean."
November 4 —	Dr. Calaway H. Dodson, Taxonomist and Curator of Living Plants, Missouri Botanical Garden. "Explorations for Orchids in Ecuador."

GUIDED TOURS

Organized groups and classes can obtain trained guides for visits to the Garden by telephoning TO 5-0440 at least ten days before their visit. Adults in tours, other than teachers with their classes, are expected to pay the usual admission charge to the Climatron, but there is no charge for children or teachers with class groups.

SELF GUIDING TOURS

Climatron —	An instructive pamphlet is available at the Climatron.
Tree Trail —	An illustrated guide sheet to forty trees is available free at the Main Gate Office.
Nature Trail —	This interesting marked trail begins near the Climatron and leads into the wild parts of the Garden

(Continued from page 4)

even in remote areas of the world. However, I have a report on the agriculture of the bush Negroes in Surinam in South America, made before modern insecticides were available, which gives us some real information on this point (Stahel, 1944).

These bush Negroes are living along the rivers far in the interior of the country, completely surrounded by primeval jungle. These people are descendants of escaped slaves who in the period before 1800 managed to get away from the plantations along the coast where they were forced to work. To prevent recapture they had to retreat far into the interior, where they have been settled now for over 150 years. To be able to exist in the jungle one has to live by hunting and by collecting the few plants which have edible parts. The Indians in those regions still live this way, but are unable to increase in numbers because they have practically used up all food within one to two days' walking distance from their villages. With an increase in population the bush Negroes, therefore, had to resort to a primitive type of agriculture. They would cut and burn the forest in the immediate neighborhood of their villages and grow corn, sweet potatoes, and a few other vegetables. Usually the first year they were able to get a reasonable crop, but the second year's production was completely impossible because of the competition with the leafcutter ants belonging to the genus *Atta.* This leafcutter, or umbrella, ant is one of the most amazing animals known. They live in huge nests which each take up 50 to 100 square feet. The nest is an underground maze of corridors which connect large chambers in which they cultivate fungi on cut tree leaves. These chambers are approximately six inches in diameter and require a new batch of leaves every day to keep the cultures growing. An average size nest uses half a ton of leaves per year. Since there can be several nests per acre, more than a ton of leaf material is removed by the ants per acre per year. In an ordinary tropical rain forest most leaves are too thick to be used by the leafcutter ants and so the ants do not reproduce excessively in the natural jungle, but the leaves of practically all cultivated plants and all garden plants are ideal for their mushroom cultures. Therefore, once leafcutter ants become established in an area, cultivation of food plants is out of the question. This is quite evident when one watches the activities of these ants. A continuous green ribbon seems to move from a tree or shrub to their nest. This ribbon consists of a dense procession of workers, each carrying a cut leaf segment above him like an umbrella.

Until twenty years ago there was no way to combat the leafcutter ants except by pouring large amounts of carbon tetrachloride into their nests and closing all exits. An alternate method was to dig a ditch around the nest, fill this with kerosene, and trample the nest, including the fungus cultures, into this kerosene. This was a very expensive method and could not possibly be carried out by the primitive bush Negroes. Therefore they resorted to the only other solution they had;

namely, to move their cultivated fields each year. By 1944 the situation had become critical. Their fields became further and further removed from their villages and in many cases had reached the edge of the river plain, where it joined the neighboring mountains and made further cultivation impossible. Flying over the area made it clear that first the bush Negro had pre-empted the forest and afterwards the leafcutter ant had pre-empted the reclaimed forest areas from man. The presence of the leafcutter ants made it impossible for a normal forest to become re-established, and a secondary kind of shrub forest developed, of which most leaves were used by the leafcutter ants.

Here we find a case in which man had no defense against insects and where the insects have definitely taken over and are forcing man to retreat further and further. This specific case is not an exception. Everywhere that he carries out agriculture in a primitive way, that is to say, without benefit of technological developments, man has to retreat before the natural forces he has unleashed. To keep fertile soil, to keep pests and diseases within check, primitive man has to move his fields at regular intervals. This one commonly sees by flying over extensive areas in South America or New Guinea where primitive agriculture is being practiced. More and more forest has to be destroyed to provide new uncontaminated fields, and the population has to move with those fields, abandoning the old worn out ones which for all sorts of reasons (weeds, insects, diseases) cannot be used any longer. The same thing would happen with our highly developed agriculture if we stopped research on control of insects and diseases. There is no doubt in my mind that, as in the bush Negro area, man would be forced out by his enemies.

We can draw the same conclusions from history. The seven lean years of the Bible were caused by bad harvests due to diseases and pests such as locusts, which even now are not fully controlled in many areas of the world and still are a threat to agriculture. Really, without proper control of pests and diseases, which at present has to be done largely with chemicals, famine is not just a remote possibility, but a likely and immediate threat. If the world population were reduced to one-tenth its present number, the pressure for high yields and continuous acreages would be reduced to such an extent that we could afford laxity in controlling diseases, weeds and pests. But now, where the greater part of the world's population is still living on the brink of starvation, we cannot relax any control measures. Few of us realize how narrow the margin is between overproduction and want. During the war, when we found that there was a sugar shortage here, the sugar consumption per person was hardly 10% below average. With sugar production up only one or a few percent, there is a surplus which cannot be absorbed by consumption, for no one eats (or should eat) more sugar when the supply is increased.

Because I am a botanist, I have dwelt mainly upon agricultural problems. But in the realm of human health the situation is similar. With rat, mosquito, or tick populations increasing because of lack of proper control, diseases like the plague or malaria or many other kinds of fever would flare up again, and one needs only to travel in city after city in Europe to find in prominent places commemorative monuments, erected after the passing of a plague epidemic, which halved or even decimated the population in the 15th to 18th centuries. For the control of malaria through mosquito control we do not have to go back very far in history. Anyone who has seen the emaciated and listless men, women and children in areas with chronic malaria, and who has compared these places with areas where proper mosquito control has rid the country of this scourge, will never want to go back to the previous condition. There are still large, mainly tropical lands where every person living there, temporarily or continuously, has to take chloroquine or other antimalarial drugs because the *Anopheles* vector is not controlled as yet. In many cases these mosquitoes could be controlled by biological means. In Java, for instance, in inland areas malaria was transmitted by an *Anopheles* species which bred in shady spots in mountain streams. By cutting every single tree and shrub along these streams, the breeding places of the particular mosquito were removed and malaria ceased to be of importance. But in the nearby jungle this control was impossible, and malaria remained as dangerous as ever. In the coastal areas of Java, malaria was transmitted by another *Anopheles* which bred in brackish water. Fish would normally eat their larvae, but when there were large masses of floating algae in the brackish coastal waters, the mosquito larvae could hide in them. In those areas effective mosquito control was possible by constant vigilance, when all floating masses of algae were continuously removed. But in nearby areas where no such control was practiced, malaria remained a scourge.

In different parts of the world there are over 60 different species of *Anopheles* which transmit malaria. Of the approximately 200 countries of the world, malaria is non-endemic in 62 because of the absence of *Anopheles* mosquitoes (examples: Bahama Islands, Hawaii), but in all other countries there were *Anopheles* AND endemic malaria. In 70 countries there are nationwide malaria eradication projects in progress, and in 8 of them (including the United States, Italy and Puerto Rico) the complete control of *Anopheles,* mainly by chemical means, has removed malaria from the list of endemic diseases. But this has been accomplished only in the last 5 to 10 years.

In the mosquito eradication program enormous numbers of other insects and other animals are no doubt killed, and this fact will undoubtedly be reflected in decreased bird populations, as Miss Carson has shown so convincingly. At the present state of our knowledge, we are faced with two alternatives: *either* leave the *Anopheles* mosquito alone, until we have found biological control measures such as were used in Java, but endanger the lives of millions upon millions of people, and force them to swallow tons upon tons of antimalarial drugs, *or* eradicate the *Anopheles* together with many other insects. It has been proved that this chemical eradication of specific insects is possible without completely upsetting the balance of nature, as the eradication of *Anopheles* and of the carrier of yellow fever, *Aedes aegypti,* has shown. But before we ban the use of chemicals for the control of pests, diseases and weeds, largely because of numerous cases of flagrant misuse so effectively described by Miss Carson, let us consider very seriously the alternative, which in my opinion is an utterly dismal and unacceptable one. I hope, however, that the result of Miss Carson's book will be a much saner and safer and better controlled use of the hundreds of really dangerous insecticides, pesticides and fungicides. And let us not emulate the attitude of the spinster in Los Angeles, who indignantly called the Air Pollution Control office, asking why they did not stop this smog, for her poor canary was dying. Heroically she added that she herself was dying too, but that did not matter.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 9:00 P. M. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

January 1963
Volume LI
Number 1

COVER: The head of Goose Fiord, Ellesmere Island, in late June with sea ice piled up on shore. See page 17.

NOTE: This is the first special Travel Edition of the BULLETIN. Members of the Garden staff traveled throughout the world during the last year; the four journeys described within are only samples of many trips.

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CONTENTS

Journal of a First Trip to Panama
A Botanist's Exploration in Australia and New Guinea
Arctic Island—A Botanical Trip to Ellesmere Land
A Look at the Lapps

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Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: BRIAN GORDON.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Vol. LI No. 1 January 1963

JOURNAL OF A FIRST TRIP TO PANAMA

N. H. NICKERSON

In March 1962 it was my good fortune to be asked to accompany Dr. Owen J. Sexton, Garden research ecologist and associate professor of zoology at Washington University, for a 2-week stay in the province of Darien, the portion of Panama located at the end of the isthmus just above South America. We were accompanied by Earl Meseth, then one of Dr. Sexton's students. Our avowed purposes were, for them, to study the behavior and distribution of certain tropical lizards, and for me, to help map the forests in their sandy areas and to collect whatever orchids, seeds, plant data, and the like were available. At that time of year, the dry season is at its height, and fissures several feet deep appear in the hard dry ground. Rivers were down 10 feet or more from their normal levels of the wet season. A surprising number of plants were in flower, however, including some rare terrestrial orchids.

Traveling to distant lands is not as difficult today as in the days of the whaling vessels and clipper ships of my ancestors. In fact, only 23 hours elapsed from the time I boarded a plane in St. Louis until we were ensconced on the Río Chucunaque in the Indian hut which was to be our home for two weeks, and where a 50-yard trip into the jungle brought us into an absolutely undisturbed primitive wilderness.

22 March

The trip down was uneventful—the "air bus" flew from St. Louis to Miami, followed by a jet to Panama City, arriving at 3:20 A. M. Shortly after 7 we were in a Turisma Aero, SA (TASA) Piper Cub, poised for takeoff into Darien, then were following the coast south. Mangrove trees came right to the edge of the ocean; water flowed out of creeks over large ripples of mud, since the tide was out. There were no leaves on the tallest trees, but many were in flower. At 8:30 we landed at El Real, Darien. The airport was a strip in a pasture, where Brahman-type cattle had only recently been chased off. Huge *quipo* trees with no leaves were prominent in the landscape. We went by jeep into the "town" of El Real and ate dinner of bread and meat fried in onions. Their coffee was delicious, but the meat was tough. We arranged a trip up to Yaviza by piragua equipped with an outboard motor. What a ride! Water flew left and right—piraguas make very good time. We arrived in Yaviza after a couple of engine sput-outs, passing the banana boat from Panama City loading platanos (green bananas) from Indian dugouts. After getting equipment straightened out, we left Yaviza with 3 natives in a piragua. One—Zorro—was to serve as our cook. We went 20 miles upstream and arrived at Porra's house at Canclones.

We were alone for half an hour, then a small band of Chocoi Indians, consisting of grandfather, his two sons, the wife of one son, and their two small girls, arrived. They all stayed except for grandfather. The Indians were really impressive—small, muscular, and well-proportioned. The older man had pierced ears; he wore only a blue loin-cloth, which he alternated with an orange one.

We set up our hammocks and had rice, fried bananas and coffee for supper, then talked with Zorro and the Indian children. They were impressed with my family pictures and willingly posed for me.

23 March

Breakfast consisted of a fried egg, fried bananas, and coffee. We were into the woods by 8. Wonder of wonders! The trail we followed was an old one, originally built by the Spaniards so inhabitants of Yaviza could come up here to hunt. We filled canteens in the Río Chucunaqui, adding halazone tablets. Many plants were in flower; there was a heavy fern cover and many seedlings, small plants and mosses. Buttresses measuring six by ten feet were common on some trees. We found a pyxidium of "coco" tree and later, the nuts and tops. One quipo tree we saw was over 160 feet high and between 10 and 12 feet in diameter. Passion flowers showed a flash of scarlet, and on the ground there were flowers of several species in the hundred-foot-and-higher category, just about impossible to collect. I found many pods of different legumes, some with seeds. The forest floor had two or three layers of dry leaves, then the bare ground. The calls of tinammos (primitive ground-dwelling birds) sounded "woo! woo!" all day, while overhead, an occasional pair of macows made a flash of blue and yellow. There were many other startling bird calls, and a column of army ants on the move, many of them toting dead insects, crossed the trail. All insects in the vicinity were jumping and thus attracting the birds which eat them. We saw no monkeys, but heard plenty of them. Lunch, of one and a half sardines and a third of an avocado each, seemed plenty. Owen and Earl collected many lizards and frogs. One snake we saw, but failed to catch, was six feet long and three inches through. The rest of the day we spent taking care of specimens—some choice plants and some choice animals, and after a beautiful evening of watching the moon rise and listening to the birds call, we went to bed.

24 March

We arose at 6:15, to fried platanos, an egg, and strong coffee. At 8:15, after straightening up camp, we went to Stand #1, a mature open forest on a hillside. On the way we saw *Mamordica*, a small squash, in fruit and flower. Owen found a fer-de-lance snake, one of the most poisonous of our wild creatures. We collected plants on the way back to our hut, then I pressed plants until supper of lentils, rice, and fresh pineapple was served. The Indians returned about dark and the father was quite friendly and talkative.

25 March

After a restless night with lots of mosquitos, we collected plants, took pictures and made notes. It had rained the night before last, but just enough to make the ground slippery. We noted, however, both days, a vast increase in leaf fall, with many of the leaves (especially from *Coco*) very brightly colored orange and red. New species of lizard continued to turn up; we now had five, all different, as well as two new frog collections.

After finishing measurements for Stand #1, we took vegetation samples in the same area. Supper was fish from the river, and rice. The fish was a sort of lamprey with no dorsal fins and one long ventral fin which waved undulantly. Its tail was long and straight and the whole fish was two feet long. Zorro caught another one and proudly posed with it for pictures. I pressed the plants we had collected and had quite a time with the Indians and Zorro in Spanish versus English, getting explained to me about the fruit of a tree which they used for making their bodies blue. After supper we sang songs with the Indians—"Happy Birthday," "Jingle Bells," and so on.

26 March

After a cold night we had fried ripe platanos and canned meat for breakfast, the meat a sort of cross between liverwurst and sausage, gray and rather tinny tasting. While Earl and Owen watched lizards, I went gathering ferns. I collected six or eight different ones, both live and preserved. Most pressed ones had sporangia. The "Boston ferns" present in the woods are beautiful. I saw a yellow and green lizard six inches long, but was unable to catch him, since he moved like the proverbial blue streak. I found two pods of something called "coca" by Zorro. They resembled two-seeded pea pods, four inches long, two inches high, and an inch through. They were

Chocoi Indians from down the river arriving in a piragua.

right where I had walked the day before and apparently had fallen during the night. It was threatening rain when we headed back at 3 and we were caught in it, but relatively little penetrated the forest. A dead tree had fallen along the trail since morning, but it had no epiphytes on it other than a few mosses. Owen and I each caught a six-inch-long lizard which may be a new species. The males have a beautiful red dewlap with a black spot. The evening passed quickly, with plant pressing, a bath in the river, and a supper of lentils and rice with luncheon meat. Zorro had gotten a letter to Yaviza composed and signed by Owen for more food and a change in our departure date to April 4th. With the rain at its height up the river came Señor Meluk, the Turk who runs the store at Yaviza, with an extra piragua for us and a few supplies. It was an education to meet him, and he enjoyed his cup of coffee "mucho gusto."

27 March

Zorro had a breakfast of egg and crackers for us, after which Wilfredo Pacheco, an Indian about 5 years old, came up with fresh green platanos and the leaves of the *Jagua* plant, whose fruit the Indians use to paint their bodies blue. He said he would climb a tree for me, so off we went to Stand #1 to collect a fine flower. He went up the tree very rapidly, hatchet in hand, and after a few quick chops, down came a branch. We then collected some flowers and leaves, which were almost two feet long but only three inches wide. The flowers were rose colored, about four inches across, with nine or ten petals and several hundred stamens in a ring around a hollow center. I put our plants out to dry in the sun; the method was not very satisfactory for some plants, but was at least better than having them wet. I then walked all around the house, noting all the plants growing there. A small sugar cane field was diagonally behind the house; out in front is a sugar-cane pressing mill, constructed of split palm stems and wire. The Indians press the juice from long canes, collect it in a sort of wooden bird bath, then pour it into vessels of pottery. They then wait 20 days for the stuff to develop a kick, and then have a party. One was scheduled for the coming Thursday.

About 11, Wilfredo, who went home for breakfast, returned with his dog. We went across the river in the "new"

Porra's house at Canclones

piragua to an abandoned plantation and entered the grove of cocoa trees all in fruit. Avocados were everywhere, from the orchard, also abandoned. Wilfredo came along to help me collect plants, and he was very good. We chopped down two trees, one 50 feet high, the other 80, to get the flowers, since the trees are homes for ants and could not be climbed. Wilfredo was quite a sight, covered with sweat as he used the small hand hatchet for an axe, grunting with every swing. When the big tree came down he triumphantly marched along its length some 20 feet out over the river, chopped off an enormous branch full of flowers, put it on his shoulders, and with a grin, marched back. I had the camera ready, and captured the grin after coaxing him to come closer. On the way back, Wilfredo, who stood about four and a half feet high, easily ducked under vines that forced me to get on my knees or chop through before I could proceed.

Porra's sugar-cane press. The cane is crushed between the rollers.

On the way back, he pointed out three more things, a tree with small, hard red fruits, a legume with huge pods, and an aroid with a fleshy orange spathe. Next he chopped a cacao (chocolate) fruit from a branch, cut open the top half, then ate a couple of the soft white seeds. They were tasteless to me, but the outer pulp was sweet. Lunch back across the river was of lentils and rice, with tea.

After lunch, we gave Zorro the afternoon off and I set about taking pictures of the collection and finishing drying the plants. At 6:30 we began getting ready for a night on the river, a real adventure. We had gone upstream barely 100 yards when we had our first excitement. Zorro was standing on the front of the piragua with a headband flashlight and a two-tipped spear about 12 feet long. Wilfredo paddled at the rear. I saw an eye about six inches under the surface, and the next thing I knew, a live Cayman lizard, two and a half feet long with a mouth full of teeth wide open, was staring up at me from the bottom of the piragua, making loud "aaggh" noises. Zorro was yelling at me in Spanish to grab the writhing animal quickly. I finally held the head with the jaws shut and then grabbed the tail firmly with the other hand. The lizard was unhurt, since the spear had passed around his leg. We went on, catching frogs, large lizards hanging in the treetops, and four small caymans.

We were gone until 10:30. Zorro also speared about six fish. I grabbed the first one and promptly got bitten on the little finger. After that incident I used the pole to knock them down off the spear.

28 March

We spent the morning cleaning lizards and drying plants. Breakfast was luncheon meat and coffee. Owen and I went to Stand #2, a sector of forest which was largely swamp when he was here last, but now was only damp ground. After taking forest measurements we returned, finding a few orchids and new fruits en route. Then things began to happen. Up came our landlord, Porra, with part of his family, 3 boys, a wife, and a cute little girl named Lydia, dressed in a necklace. It was a bit crowded, but we got along. The kids were a very happy bunch, and sang all evening. Porra agreed to take us to the Pan-American Highway eight miles away in the morning. His piragua was loaded with corn, green bananas, and six fowl which, when he let them out, promptly made themselves at home and slept under the hut in a steel drum.

Zorro with two Cayman lizards

29 March

After the usual breakfast we walked toward the Pan-American Highway. The forest became increasingly more tropical with palms and much undergrowth noticeable. We saw a number of fruits and seeds unknown to me. Our path crossed the Río Canclon seven times. The trees were magnificent; they mostly had some leaves, but the leaf cover was less than that near our hut. Three-fourths of the leaves around our hut were still on; thus a myth of the tropics that the forest is deciduous in dry season was not true here. We were in an evergreen tropical forest with a few exotics present which did lose their leaves entirely. I went for a walk up the highway in both directions, finding some terrestrial bromeliads (members of the pineapple family) which were eight feet high. I also spotted two peccaries (pig-like animals) crossing the highway, which is only a ten-foot-wide swath in the woods, growing up with seedlings and cluttered with dead branches. It is passable, however, and could easily be used by a jeep in dry season. We ate lunch, then started back. A tree had fallen across the trail since we had been there, so I got a few orchid plants which ordinarily grow up in the treetops. A few yards farther, Porra held up his hand, fired his rifle (a .22 calibre), missed, fired again and killed a female deer. It weighed about 50 pounds, and Porra, about 45 years old, carried it without stopping the remaining 6 miles to camp, making the one concession of removing his shoes. We had venison cooked with rice, Indian-style, for supper. With a little curry on it it was very tasty. Porro then told me about his corn, which grows 9 feet high and about 2 feet apart in the rows. A little later, more Indians arrived and sampled the sugar-cane liquor. We each had to have a glass, and found it was not bad, being a sort of highly carbonated weak beer.

30 March

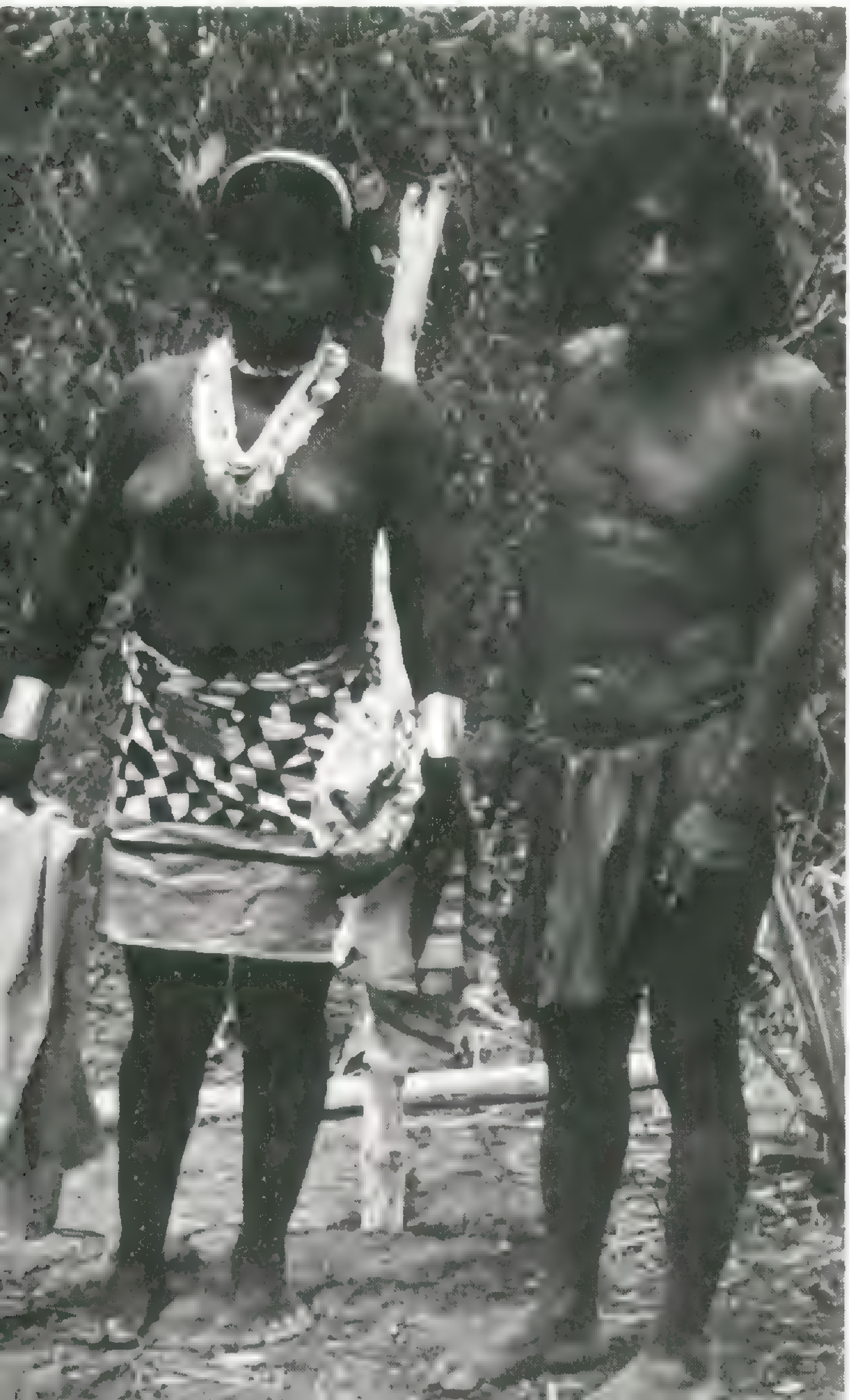
Our breakfast of deep-fried venison was quite filling. We spent part of the morning getting all our stuff upstairs in the hut to make room for the long-awaited Indian party to be held soon. On the way to Stand #1 I found three spikes of a ground-growing orchid in flower. The spikes of this orchid, unique to the Canal Zone, were 15 inches tall, each with eight to ten brown-green flowers. There were many fleshy roots resembling asparagus. It was the most humid day we encountered, and the 90-degree heat plus the 100-percent humidity drained us of all energy. We went to a couple of fallen trees whose tops were all covered with orchids, rested and ate lunch, then we each took a nap! It seems strange, but undoubtedly the idea of a siesta has merit in this climate, even for the white man. We finished measuring and then returned to camp. I managed to find a few orchids on the forest floor as we were measuring and there were a few new ones on the fallen tree. It was, of course, impossible to get up to the tops of the giant trees, where orchids were in abundance. Supper was more venison, gravy this time, made from the ribs and other bones—plus potatoes and tea. The river was now at its lowest, being more than 15 feet lower than it was when we arrived. We tested its depth on our way across last night; in the middle it was more than 12 feet deep.

31 March

We awoke at 5:45 to hear a loud conversation between Porra and his good friend, both of them patriarchs of this neighborhood, discussing plans for the day. As soon as we got out of bed, each of us was presented with a large cup of home brew. It went down a bit hard, but we could not risk offending them. (*Our* feelings did not matter.) Porra explained that there would be many people here today, and we should take many pictures, since they would all be in costume. As if to amplify the point, he got out an old baseball cap with red visor and a pair of faded blue canvas sneakers with toe-places worn through. Porra had worked all day yesterday putting up a railing around the house to keep tipsy relatives from falling off. Owen and Earl measured yesterday's collection of lizards out front with an audience of four children. We were expected to be present for the ceremonies, and the people started coming between 12 and

2. After a quick lunch we were given our first big sample of "huaracho," the native beer. The male Indians arrived first, resplendent in necklaces, breastplates, body paint and brightly-colored clothes. We were kept busy taking pictures—Porra wanted us to get pictures of everyone. Counting all the children, about 90 people came and went during the afternoon. The beer was handed around freely; shortly later most of the Indians were tipsy. The local *comisario,* who reports to the government, was a tall Negro, and he made the rules—no machetes, no knives, and no axes. He also broke up the fights, which were present but not numerous. Another old fellow appointed himself roving bartender and kept making the rounds with a teakettle full of hootch and a communal cup. The women all sat together and the men sat in small groups, but the dancing started soon after the arrival of a flutist. The dancing was a shimmy and stamp type somewhat like rock and roll. The instruments played were a flute, an accordian, a small and a large drum.

A Chocoi Indian couple dressed up for Porra's party.



There were about six Indians who did not take much beer. They sat down by the water most of the time, and we joined them. Zorro came down also, and we had our supper of sardines and crackers there. We went across the river to spend the night on a sand bar. Sometime during the night the music stopped, and most of the Indians slept somewhere in the hut.

1 April

The Indians started leaving, piragua by piragua, about 5:30 and we came back across the river about 6. The Indians were very quiet and a few were still sleeping in the hut until their wives gathered up the belongings and woke them. Finally only Porra, his wife, and the three children were left. For dessert after lunch we had sugar cane, brought to us by Lioporto, one of the Indian children. The technique of eating sugar cane is to chop off the rind and chew and suck the pith. Sugar cane is like a tough corn stalk and the flavor is something like sugar with some molasses mixed in.

I spent the early afternoon taking a survey of the vegetation around the hut. Later we went fishing, with great luck, catching a dozen fish altogether, of which nine were catfish.

2 April

This was the final day for collecting plants, and after a discussion of what the Army might find useful versus what we would like to do professionally, we set off for the woods. Lioporto, eight years old and already familiar with the forest, scaled a tree near the river for me and chopped a branch from a *Triplaris* tree. During the afternoon I pressed the plants and took a few pictures of the area.

3 April

Sunrise here is about 6:30 and by 6:45 the heat can be felt. We spent the morning packing the live plants. We had given the children a few things to play with and they were happily engaged in doing up bananas and old flashlight batteries in string. Last night the Indian children had brought us oranges, still green but a welcome change from avocados and rice. Porra liked my pen, and I gave it to him along with my new gray cap, which fitted him quite well. We spent the day getting ready for departure the following morning.

4 April

Our plan called for floating down the river in our own piragua about two miles to a series of rapids which are hard to navigate with a motorboat. There at the lumber camp we met one of Zorro's friends, who had an outboard motor. With that on our piragua we continued downstream to intercept Señor Campo, who we supposed was on his way upstream to get us. We found him only by chance, since he had not gotten the message to come a day early for us. We finally reached Yaviza by 10 and were on the way again soon afterwards, after paying for the food and for Zorro's work. Zorro was pleased to get a little more than the standard $3 per day. We were soon waiting for the little TASA airplane to fly us to Panama City, where we cleaned up (Earl and Owen had let their beards grow and had to get them shaved off) and had a look at the city before flying to Miami and home.

In reflecting on the trip I find I now have some knowledge about things I did not know before. The Indians of the tropics are well adapted to their way of life, and it is a moot question whether we should attempt to change it. Many bilingual people, some of them illiterate, gave me new respect for the possessor of two languages. Spanish is an absolute necessity south of the border.

The forest lands are being logged off and agriculture is developing. The area needs all types of soil and water specialists as well as ecologists to prevent harmful practices from getting out of hand. Bulldozers, for example, do an efficient job of eliminating 150 to 200 years of tree growth, and destroy replacement trees at the same time. Once the timber cover is gone, the soil will have no protection from erosion, since the tropical sun is hard on plants which are not large.

All in all, I'm glad I went—the things I saw could not be learned from any sort of book.

A BOTANIST'S EXPLORATIONS IN AUSTRALIA AND NEW GUINEA

F. W. WENT

On August 29 of this year a remarkable new laboratory named CERES was opened in Canberra, the capital of Australia. This laboratory intended for research with plants was hailed by Mr. Menzies, the Prime Minister, as a very important milestone in the development of Australian agriculture, and many other glowing words were said about it. I was present by special invitation because in many respects this new research laboratory was patterned after the Earhart Plant Research Laboratory I had built in Pasadena, the so-called phytotron, and I had worked for several months in Australia in 1955 consulting with the plant scientists there concerning the construction of a similar laboratory which now has become a reality. It was quite a thrill to see how the work started in Pasadena was really coming to fruition. Perhaps more in Australia than anywhere else in the world the importance of studies of the environment has been recognized, for during my stay in Australia I also visited a phytotron in Brisbane which was constructed there for the Commonwealth Sugar Refining Company to study the behavior of sugar cane under different climatic conditions.

Having traveled halfway around the world for the opening of this laboratory, which was accompanied by a symposium on the problems of the effect of environment on plants, I wanted to use the occasion to study some of the remarkable types of vegetation which occur in and near Australia. Being there in September, it was possible for me to see something of the spring flora of the central desert and of western Australia. Since there was not enough time for both, I decided to visit specifically western Australia, since in 1955 I had already spent several weeks in the deserts of central Australia.

The western Australian flora is one of the most remarkable anywhere in the world. In a relatively limited area, extending about 400 miles north from the southwestern coast of Australia and several hundred miles east from the western coast, relatively abundant winter rains occur. In the southwesternmost region the rains are pretty well distributed throughout the year and amount to about fifty inches, allowing a lush forest growth with the monumental karri trees *(Eucalyptus diversicolor)* which tower over all other forest trees and reach a height of close to 300 feet. Moving toward the north and east, the rainfall decreases until at twenty to thirty inches the vegetation has decreased to a shrub or sclerophyll forest, and still farther, where the rainfall decreased to ten inches or less, an endless desert occurs which stretches for 1000 to 2000 miles and effectively isolates the southwestern Australian flora from the rest of Australia. This isolation has resulted in the development of a very large number of exceptional families and genera which occur nowhere else in the world. There are approximately 100 so-called endemic genera which have their only representatives in southwestern Australia. A typical example of that is *Cephalotus*, an insectivorous plant occurring only in a few bogs. During the two weeks' stay in this area, my wife and I traveled exactly 2000 miles in a rented car through this botanical wonderland, collecting approximately 650 species of the 10,000 which occur in that region. Because of time limitation we had to restrict our collecting to a special group of plants, the shrubs which were mostly just in flower during our stay.

Among the many hundred kinds of shrubs occurring in western Australia there are perhaps only a dozen which have normal leaves such as we find on our shrubs and trees; that is to say, flat, thin, flexible, lush green leaves. Ninety per cent of the shrubs have stiff and spiny leaves which made collecting a painful experience. Our hands were continuously scratched up. More than half of all leaves were needle-like, usually ending in a sharp point, and very often it was impossible to tell whether we were dealing with a conifer or a *Proteaceae* or another family, without seeing the flowers or cones on the branches. Other peculiarities of this western Australian flora are the frequency of red and particularly blue flowers, and the spectacular flowering plants in which the flowers are combined into large flower heads.

Forest of giant *Eucalyptus* 250 feet tall, in western Australia.

Whereas in most areas in the world leached sandy soils have a relatively poor flora, in Australia the opposite is the case; that is to say, the poorer the soil, the richer the flora, and the more different species can be found. In the richer soils the flora is usually relatively uniform and less interesting, but the sand plains, which stretch in the somewhat drier areas for hundreds of miles and which are very poor in nutrients, are perhaps the richest plant hunting areas anywhere in the world. It seemed completely impossible to collect all the different kinds of plants which occur there, and even when we were staying for days in the same area, new plants continuously cropped up. It is difficult to explain why under the poor soil conditions such an enormous variety of plants has developed. Particularly rich in forms were the myrtle family *(Myrtaceae)*, *Proteaceae*, *Goodeniaceae*, sundews *(Droseraceae)* and *Acacias*.

In Perth the paths of my wife and myself parted. She returned to St.

Louis by way of the Orient and Europe, whereas I made a side trip to New Guinea. As a student at the University of Utrecht, I had been assistant in taxonomic botany for a number of years and during that time I had been specifically assigned to the flora of New Guinea. During the first quarter of this century a number of expeditions had been sent into the interior of the Dutch part of New Guinea, which at that time was completely *terra incognita.* In those years a new race of natives was discovered in the interior, differing very much from the Papuans of the coastal regions. They were small in stature, almost pygmies. They had never had any contact with other people except occasionally trading with the coastal Papuans. They were cannibals and lived mainly by means of a primitive type of agriculture, cultivating sugar cane, sweet potatoes, and a few vegetables on their highland fields, which extended from 6000 to 8000 feet in altitude. These tribes have recently been in the limelight through articles in the *National Geographic Magazine* and in *Life*.

When I received a letter from Mr. Herman Slade, Director of the Polymer Corporation Pty. Limited, Homebush, N.S.W., Australia, who is an orchid enthusiast, in which he suggested that I visit New Guinea while in Australia, this immediately struck a responsive note and I wrote a letter to John Womersley, Director of the Botanical Garden in Lae, Territory of New Guinea, to inquire whether he could in some way help me in visiting the highlands there. This was the best move I could possibly have made because John organized the most incredibly interesting trip I have ever made in my life. Lae lies in the formerly German northeast part of New Guinea which now is a trust territory administered by Australia in conjunction with the southeastern quarter of New Guinea, Papua. Lae has a white population of several thousand people and is the capital of the territory. It has a fair number of stores where most of the ordinary necessities of life are available. A very interesting experience was a flower show which was held by the New Guinea Horticulture Society. This was already their fifth annual show and I was very pleasantly surprised at the high quality of the plant material exhibited. It seemed that all of Lae was present at this two-hour show. Not only flowers grown in the neighborhood of Lae were exhibited, but also cool weather plants such as dahlias, which had been sent from Wau and other highland localities with a much cooler climate. Actually, flower growing is a major activity not just of the Australians living there but also of the natives. Wherever I walked, even in the remotest villages of the highland Papuans, flowers were grown around houses, and sometimes in the middle of cultivated fields there was a flower garden. Flowers were used for decoration; natives wearing orchids and other flowers in their beards or in their hair were a common sight.

Still more remarkable seemed to me the use of orchids as ornaments for houses. The primitive huts in which the natives live in the highlands were usually topped by long poles to which orchids and other epiphytic plants were tied. In gardens one also would see some of the outstanding rhododendrons which grow high up in the mountains of New Guinea and which apparently were cultivated by the natives.

The highlight of my stay in New Guinea was an expedition to the Mt. Wilhelm area. This is the highest top of the mountain ranges in the eastern part of New Guinea and the mountain exceeds 15,000 feet in height. As we returned from our expedition a group of surveyors went up to determine its exact height, which was not known at the time of my visit.

Mt. Wilhelm lies in the middle of a very inaccessible and very wild mountainous country. Usually the highest peaks occur in young mountain ranges which have not been worn down by erosion to the extent that the older mountain ranges like the Appalachian Mountains have been. This means that mountain sides are very steep, valleys are very deep, and the terrain is very rough. By good fortune there is a large valley, the Chimbu, which reaches into the Mt. Wilhelm area. This is rather densely populated up to a height of 9,000 feet, beyond which no cultivation of food plants is possible. Like the rest of the central highlands of New Guinea, this valley was first visited by white men in the 1930's and a number of missions were established. Near the upper one in Keglsugl, an airstrip was constructed, which for a long time was the only means of access to this upper Chimbu valley with 20,000 inhabitants. In a chartered Cessna plane we flew from Lae to Keglsugl, where we met with another part of the expedition which had come by Landrover from Koroka, the district capital. At the airstrip we were met by dozens of natives, all eager to earn a few shillings by carrying our baggage to the base camp at Lake Aunde at 11,500 feet. Whereas some of the carriers were toting loads of 50 to 100 pounds, others came along just for the walk, carrying nothing more than a pair of shoes for some of our party. A young boy of about twelve years attached himself to me and carried my plastic bags in which I collected orchids. He also would give me a helping hand when the steep trail became too muddy and slippery to negotiate with my leather-soled shoes.

Giant *Araucaria* trees protruding from the mid-altitude mountain rain forest in the New Guinea highlands.

By nine o'clock in the morning when we arrived at the Keglsugl airstrip, Mt. Wilhelm was already hidden by clouds, but the airstrip was still open. As we walked up, the clouds became more and more threatening and the last two hours we walked in a steady rain drizzle. At such high altitudes the clouds do not extend very high above you and therefore rains at those altitudes are usually gentle but very penetrating.

In addition to the expedition leader, the botanist John Womersley, another taxonomist, Dr. Peter van Royen, an agricultural officer, Graham Collett, and two agriculturists, Andrée Miller and Sue Osborn, were members of our party. We had brought two native plant collectors from Lae, Tomyang and Yakas, and half a dozen of the highland Papuans stayed with us in our camp, among which there were House-cook and Man-belong-Mountain, the official guide to the top of Mount Wilhelm. Our baggage carriers stayed overnight, and every day our camp was visited by a dozen or more natives, who made the 3-hour climb to see what we were doing, help in collecting plants, bring us fresh vegetables, or just simply to stand in our way. The vegetables were all brought by the women, who tend the fields, and consisted of potatoes, sweet potatoes, cabbage, peas, broad beans, and a few tomatoes and ears of corn carried up from much farther away.

For a whole week we collected in the Mt. Wilhelm area, largely in the area between our camp next to Lake Aunde and the highest altitude where trees were still growing. This altitude is approximately 13,000 feet and corresponds to what in the temperate regions is called timberline. Whereas in the Sierra Nevada in California and in the Rocky Mountains timberline is a very sharp transition from the forested area, with usually fairly large trees growing together in dense stands, to a completely treeless area, with at most here and there a few prostrate weather-beaten trees, here in the tropics the transition from forests to grassy, treeless alpine vegetation is very gradual. At 12,000 or 12,500 feet the forests are still dense but the number of trees in them decreases and most of the plants are shrubs of not more than fifteen feet in height. The only exception is *Podocarpus compacta*, which forms trees up to fifty feet in height which emerge from the shrubby forest. As one gets higher, the number of *Podocarpus* trees decreases and finally at 13,000 feet they disappear altogether and the shrub vegetation becomes more and more open and becomes easier and easier to penetrate. This same gradual disappearance of trees I found in the Andes near Cuzco, in Peru, where trees disappeared at approximately 13,800 feet, somewhat higher than in New Guinea. The reason for this probably lies in the much higher elevation of the Andes. It will be interesting to find a logical explanation for the difference between a sharp timberline in temperate regions and the gradual one in the tropics.

The forest around our camp was a very peculiar one. There were many species of *Rhododendron* and *Dimorphotheca* with brilliantly red or pure white flowers. The flowers of the blue-berry *(Vaccinium)* could make the whole tree look pink. With the exception of a few *Araliaceae*, the leaves of most of the trees and shrubs at this altitude were dark shiny green and light green underneath, and most of them were relatively small and round. This is quite different from the trees and shrubs in most other sub-alpine areas which do not specifically have the small orbiculate leaves. At the altitude of our camp there were not many epiphytic orchids but the few that grew there, such as *Dendrobium sophronites*, were brilliantly colored and formed bright brick-red spots on the dark bark of the Podocarpus trees.

When we returned from our sub-alpine camp, we were going to drive back from Keglsugl in a Landrover along a dangerous road winding from valley to valley along steep slopes. We waited for this car to arrive but we heard that it had been wrecked somewhere along the road. Thus we had to wait a whole day for another car which was dispatched from the district capital, Goroka. This trip gave us the opportunity to see much more of the rural life of these highland Papuans. They do not live in villages, but their huts are distributed singly or in small groups along the slopes where they have their fields. There are two types of houses—the larger ones where from six to twelve men live together, and smaller ones occupied by one or two women with their children. Most of these huts are low with thatched roofs and bark walls, with a small low opening for a door through which one has to crawl. Inside there is a fire going most of the time because of the very cool weather at the high altitudes. Since there is no opening for the smoke to escape, these people are almost continuously sitting in smoke, at least as long as they are inside the hut, and smoke is the all-pervading smell of people and of the surroundings of the houses.

Except for a loincloth no clothes are

A reception committee of highland Papuans at Keglsugl airstrip.

worn, although a certain number of both men and women may wear a shirt or trousers in response to western civilization. Women and girls usually wear beads and if they are wealthy they also have a white pearl oyster shell hanging around their neck. Usually their ears are pierced to hold ornaments but I saw this hole also used to hold a cigarette. The men have their nasal septa pierced and may wear pigs' teeth through the holes. For decoration the men often wear flowers and ferns in their hair and beards.

In some of the larger settlements we saw schools. Only a very small proportion of the children can be accommodated in the schools but there is an almost pathetic desire to learn. When a new school is opened, parents with their children will come from near and far and some of the children when accepted may have to walk two or three hours to and from school each day, which they gladly do as a price for education. At present not more than 10% of the children can be accommodated by the schools, and in one place (Gimbogl) I saw a school building together with a teacher's house which had been built by the natives on their own initiative. After these were completed they asked the Government to send them a teacher so that their children could be taught. As an additional service the natives tended the school garden, which was bright with flowers such as impatiens, cosmos, zinnias and cleome. Unfortunately, the native society cannot use the skills which the children are being taught, since they do not have any need as yet for people who can write or calculate. This is perhaps the most pathetic part of the whole educational problem—that they desperately want education but do not know what to do with it.

Later we made another trip into the mountains just south of Lae, where we stayed in Bulolo and traveled to Wau and Edie Creek, all areas of gold-mining fame. The magnificent forests covering the mountains everywhere are now being exploited and merciless logging supplies wood for sawmills and a large plywood factory. Yet there is a good deal of reforestation going on, almost all with Araucaria. The splendid *Araucaria cunninghamii* and *A. excelsa* which I saw in Australia fade into insignificance when compared with the *Araucaria hunsteinii* of the forests above Bulolo. They grow in between the enormous trees of the rain forest which there reach a height of over 150 feet, but they tower high over all other forest trees, and many of them are 300 feet tall. This means that in future botany and forestry books they will have to be mentioned together with Sequoia and Eucalyptus as the tallest trees in the world. And the tallest and most magnificent of them should be protected in special preserves. It is true that these Araucarias have an enormously fast growth rate and therefore they are not as wide as Sequoias because they are much younger when they reach their phenomenal height.

I was surprised that the number of epiphytic orchids in these forests was relatively small. Here and there one saw a tree densely covered with them and with large specimens of the staghorn fern, *Platycerium Wilhelminae* *reginae.* Even though I felt sorry to leave this botanist's paradise, I was getting anxious to return to St. Louis, the Garden, and the Climatron, which I found in fine shape with more growth than I had expected.

ARCTIC ISLAND — A BOTANICAL TRIP TO ELLESMERE LAND

HENRY N. ANDREWS

A considerable part of the land surface within the Arctic circle is a barren wilderness of rock and it was in part this very barrenness that attracted us to Ellesmere Land. We hoped to find evidence in the rocks of the plants that lived there in bygone ages, for the northern islands have not always been the forbidding ground that has drawn so many rugged explorers to their last journey. For long periods of time, in fact over a span of at least 300 million years, forests have flourished under conditions that were very different from those of today; plants preserved in the rocks as fossils reveal the Arctic, prior to the recent Ice Age, as having had a much milder climate than at present. But large areas remain unexplored and more information is needed to fill out what is still a rather sketchy picture. As an introduction to our own venture it may be pertinent to mention a few of the fossil deposits that have shed light on the contrasting landscapes of the past and present.

Spitsbergen has yielded up an abundance of information about the plants

Impressions of the trunks of an ancient forest covered the sedimentary rocks in the foreground; only a few yards away is the wall of the icecap.

that grew there in Tertiary times—dating back some 50 to 60 million years. Impressions of leaves and seeds indicate forests composed of maple, alder, birch, hazelnut, witch-hazel, Katsura-tree and the dawn-redwood *(Metasequoia)*. An important source of information concerning the ancient forests now comes from studies of fossil pollens, and the Norwegian botanist Manum has recently added a notable chapter to the plant records for this Arctic archipelago; he has found pollen of several evergreens including fir, spruce, pine, larch and the umbrella pine *(Sciadopitys)*. The pollen record also indicates the former presence of numerous flowering plants, among them being members of the heath, sundew and cat-tail families as well as others that are not closely comparable with any living plants. It seems quite clear that the early Tertiary climate of Spitsbergen was a temperate one. (Some liberty is taken here with the use of common names; they should be regarded as being closely related but not necessarily identical with the living species.)

From Disco Island, midway along the west coast of Greenland, a fairly rich fossil flora has been found in rocks of Chalk Age *(Cretaceous)* which are about twice as old as the Spitsbergen deposits mentioned above. It has not been possible to correlate all of the fossils from Disco Island with modern plants, as might be expected in view of the distant era in which they lived; however, the general relationships of many of them are evident. Ginkgo and several of its relatives occurred in some abundance. The conifers were rather well represented and it is of interest to find that the flora included both evergreen and deciduous trees. There were several ferns including the lovely gleichenias, which are widely distributed today in the tropics and near-tropics; among the flowering plants there are members of the oak, magnolia, laurel, sycamore and legume families. The most exciting of all, and perhaps the most discussed fossil plant ever to have come out of the Arctic, is a fine leaf and fruit that compares closely with the living tropical breadfruit. This is something of an enigma and has been the focal point of considerable discussion about the climate of that area during the Cretaceous; the sum total of the evidence indicates that it quite certainly was more hospitable than it is now but was probably temperate rather than tropical.

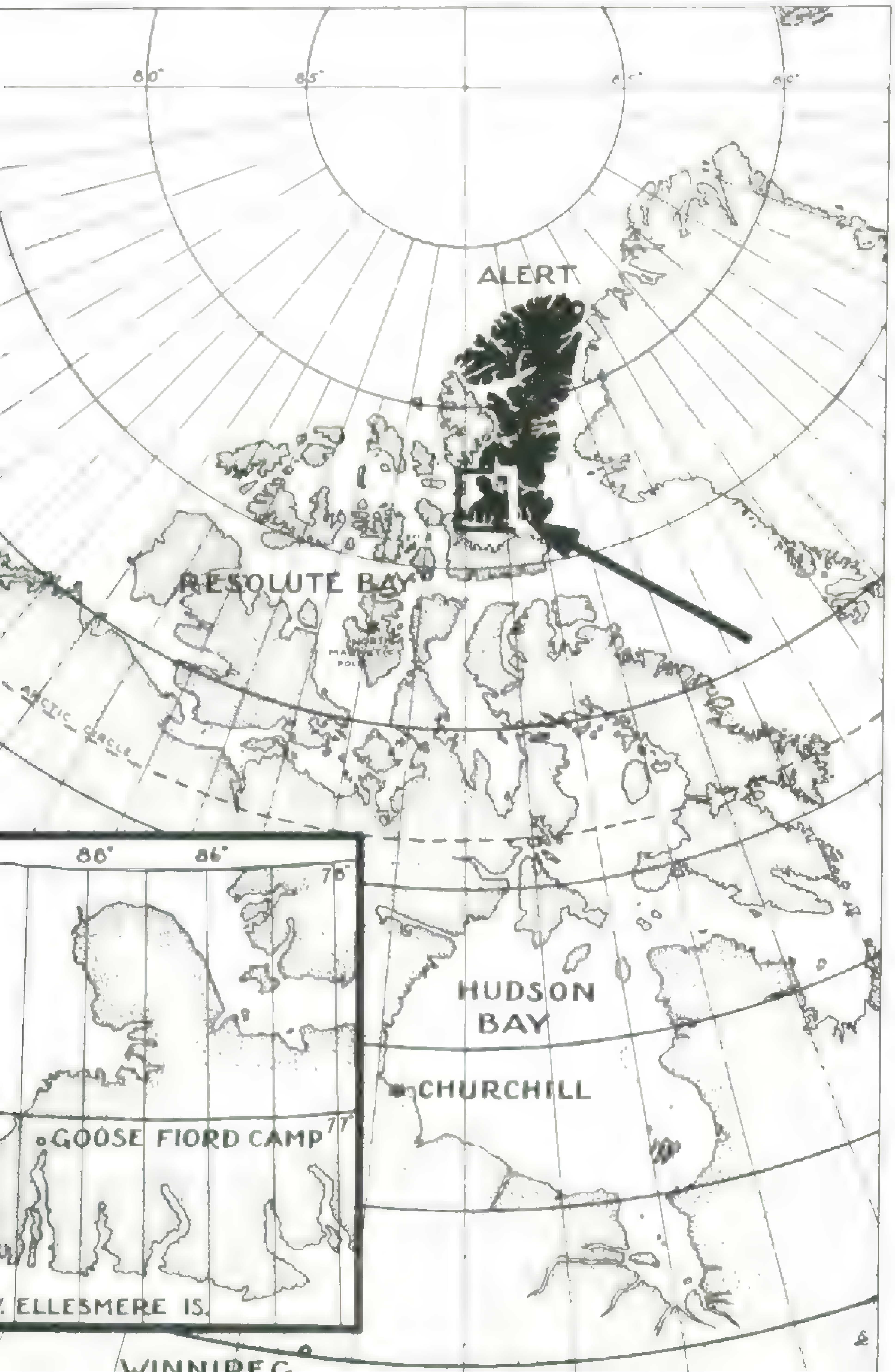
Going back even further in time, to the early part of the Jurassic period (about 150 million years ago), and over on the east side of Greenland, one of the most prolific fossil floras ever discovered anywhere has revealed a wealth of plant life. A few years ago Professor Harris of Reading University in England spent a year there, in the vicinity of Scoresby Sound which lies at about 70° north latitude, and his collections have added a great chapter to our understanding of Arctic forests of the past. The results of his studies appeared in five volumes and it is hardly possible to sum them up in a few lines, but a few of the highlights give some idea of the richness of the ancient flora. There were many cinnamon-fern relatives—so abundant today

Camping gear, food and scientific equipment being unloaded at our first camp.

along the roadsides of our eastern states—as well as gleichenias and tropical marattias, and several other fern families that are confined now to southeastern Asia. There were numerous cycads and cycad-like plants, an abundance of ginkgo relatives, and, most interesting of all, many fossils that cannot be compared closely with any living plants. If one could slip back 150 million years into the past and wander through these forests, of what is now the east Greenland coast, there would be both friends and strangers, but regardless of how many could be recognized it would be a very different landscape from the present one.

Investigations such as those outlined have given us the knowledge we have of the vegetation and climate of the Arctic in the past. But many of the collections of fossil plants that have been made to date have been acquired more or less incidentally to the main objectives of the particular expedition. In view of the vastness of the country there is a strong likelihood that a concerted search, or rather, many searches, would be apt to turn up new plants in previously unexplored deposits. Ellesmere Island is a large chunk of land and few paleobotanists have visited it. We thus set out with several objectives: We wanted to find out more about any and all plants that lived there in former ages. We were particularly hopeful of finding a particular fern-like plant, *Archaeopteris*, as a source of information bearing on the origin of early seed plants. One of our party, an expert on Canadian peat deposits, wished to investigate peat formation in high latitudes; and finally, it may be confessed we wanted to see the Arctic!

Our small expedition of three left Winnepeg early one morning toward the latter part of June and landed a few hours later at Churchill, on the west short of Hudson Bay. Several days later, with our three-quarters of a ton of baggage assembled, we took off in a Canadian Air Force plane for Resolute Bay another five hours to the north. We had arranged with a commercial company to meet us there with a DeHaviland "Otter," capable of carrying about a ton including passengers and baggage. After a meal, and with our baggage transferred, we took off again on the final lap of our journey, to the head of Goose Fiord.



North central Canada and the Canadian Arctic. Ellesmere Island appears at the top in solid black with northern Greenland to the right. The southwest part of Ellesmere (area within square) is shown enlarged at the lower left.

Transportation in the Arctic is still a difficult problem but today it is largely by air; with some luck and a good deal of money it is possible to get places in a few hours or days that required months or years a few decades ago. I was delegated to ride in the cockpit with the pilot and select the landing site at our destination. During the two previous flights the vegetation had been gradually becoming more stunted until it disappeared almost completely. Aside from the change in the vegetation the most impressive feature of the north country is the endless number of lakes; at almost any point from Winnipeg to Resolute there are thousands of them in view from the air, of all sizes and shapes.

The complete barrenness of the country for the first hour out of Resolute was depressing; the low-lying brown earth with hardly a vestige of plant life strikes no joy into the heart of a botanist. But as we approached the southwest coast of Ellesmere the abrupt headlands, and snow-caps on the plateau country, marked a scenic change for the better. Goose Fiord is a narrow band of water extending inland for 20 miles with sides that are quite steep in places, and rising as high as about 1500 feet. At the head of the fiord the land is comparatively level with, as we found later, a meager but lovely flora where dwelled a fine herd of caribou. I motioned to the pilot toward what appeared to be an acceptable campsite central to the rock exposures we wished to investigate. He swooped once over the area, picked out a stretch of 100 yards or so that was reasonably free of large rocks, and down we went—to a successful landing.

After a day spent in establishing a camp and exploring its immediate surroundings we set to work in earnest to search for the ancient fern-like plants that had lived here some 300 million years ago. Our "leads" were two-fold: we had some knowledge of the geologic age of the rocks and, in 1902, a Norwegian expedition had spent some time on this part of Ellesmere and had found a few specimens. Aided by a rough sketch map of the north end of the fiord we set about locating the spots where they had found fossils some 60 years before.

This part of Ellesmere does not conform with the concept of the Arctic as a land of perpetual snow. We were, however, welcomed with a few days of weather that was something short of tropical. On the second day sleeting rain descended as we ate lunch on a high rocky slope, and the following day and a half we remained in the tents hoping that the extra weight would help keep them from blowing away in the gale that poured down from the snow field a few miles to the east. But for most of the next month the sky was cloudless with the sun making a great circle overhead every 24 hours. The temperature ranged from 45 to 55° F. most of the time and a few days were uncomfortably warm for us with heavy packs on our backs. In late June the fiord was still frozen, with great masses of sea ice piled up on the shore and a few seals sunning themselves on ice cakes a short distance out; but with two weeks of steady sun it was transformed into a sheet of brilliant blue water. Most of the country within a radius of 7 or 8 miles of our camp was free of snow by mid July—a rocky, barren land with the exception of the valley immediately to the north, which was carpeted with a rather lush growth of grasses, sedges and moss. On the several trips we made in that direction we always encountered the caribou and with some patience on our part they would come up to within 50 yards of our cameras. The lone musk ox that we found one day was less curious of the two-footed invaders and we followed him for an hour, finally using a low hillock as a shield to approach close enough for a photo. In a ravine near our camp lived a pair of magnificent Arctic

Cotton-grass appears in the bogs in mid-July.

today, and only a few yards away rose hares that seemed to accept us without question as a part of the landscape. On one occasion we were fortunate in encountering a polar bear that was stalking a seal asleep on an ice cake off shore; as he galloped away from one ice cake to the next, evidently more in surprise than in fear of the plane, it was clear that we were unwelcome intruders in his realm.

Although we were in search of plants that lived in the Arctic long ago it is hardly possible to ignore the living. In late June the lower slopes were dotted with patches of a lavender saxifrage *(Saxifraga oppositifolia)*, by far the most showy of the 30 odd flowering plants we collected, although a close competitor was a yellow poppy *(Papaver radicatum)* that came into bloom in mid July. Although less colorful than these two, the Arctic willow *(Salix arctica)* was most abundant, growing perfectly prostrate it formed rather dense mats over the rocky ground and developed a little more luxuriantly in the lee of banks, where it gained some protection from the wind. There were several other saxifrages, a few members of the mustard family, and one lone patch of a magnificent purple evening primrose *(Epilobium latifolium)*—and occasional dandelions!

Although less colorful, the grasses and sedges are fairly well represented and in late July cotton-grass *(Eriophorum scheuchzeri)* with its lovely white ball-like heads put on a welcome display in the boggy ground not far from the tent. Lichens are abundant in this part of the island, and we gathered about a dozen different mosses.

The long cold and dark winter with temperatures ranging down to 50° below zero offer a serious obstacle to plant life but an equally rigorous one is the very low rainfall. For the three year period 1959–61 the annual precipitation (rain and snow) at Resolute Bay equaled about 6 inches, while at Eureka, a weather station on Ellesmere some 200 miles north of our camp, there was only a little over 2 inches per year, resulting in extreme desert conditions.

As a result of a month's search in the vicinity of our Goose Fiord camp and at another locality some 40 miles to the north, we were able to box up several hundred pounds of fossil plant specimens. A thin coal seam was located which we hope will yield spores, but most significant are specimens of *Archaeopteris*, the fern-like plant that may have been a forerunner of the early seed-plants. At two localities we found reproductive structures and a few precious fragments that are petrified, showing well-preserved internal structure. These were discovered somewhat accidentally. A few days after our arrival at Goose Fiord we set out to reach the icecap that covers the plateau some 7 or 8 miles to the east. Unable to follow our planned route due to streams pouring down from the melting ice field, we detoured far to the north and in so doing encountered extensive ledges with a magnificent display of stem impressions. Some of these represented trees of 10 inches in diameter, quite in contrast to the diminutive vegetation of the blue wall of ice as shown in one of the photos. We could readily visualize the forest of 300 million years ago where the icecap now covered the plateau. In order to study this spot more carefully we set out to reach it again about a week later; this time we followed what we hoped would be a more direct route that had been plotted roughly from a reconnaissance flight in the plane. It must be admitted that my routing was not perfect and the distance covered was probably greater than on the first venture partly because we ascended the wrong spur out of the valley; but it was on this spur, only a few hundred feet above the valley floor that we found the petrified fragments of the leaf stalk and its branches. These are in an initial stage of laboratory study but clearly promise to reveal exciting new aspects of the plant.

Thus a mistake in routing and frustration by a glacial stream led us to our most important find. We are now sure that future visits, with or without mistakes and frustrations, will yield much more about the ancient forests of the Arctic.

A LOOK AT THE LAPPS

MRS. WILLIAM EISENDRATH, WITH KARL LINNALUS

My Arctic trip did not extend as far north as that of Dr. Andrews, nor was it to a completely uninhabited area, as his was. The travel ads described the trip my daughter and I took as the "7-Day Air-Sea Tour to Northern Norway." We spent the first of our 7 days flying from Oslo to Bardufoss Airport, the end of scheduled air service. As we flew north each airport was more primitive than the last, until at Bardufoss we debarked on a high meadow graced only with a shed and a few military jets. From there we took a 3-hour bus ride to Tromsø, the largest town of the region (population 23,000). Tromsø has been the jumping-off place for several voyages of exploration to the Arctic, and is today the location of a northern lights observatory, an aquarium, a whaling station, an agricultural school, and an extraordinary museum which includes many Arctic exhibits and botanical displays. The curators of the Tromsø Museum have edited a most helpful book entitled *Norway North of 65*, published by the Oslo University Press in 1960. This book, printed in English, contains useful facts and descriptions about the life in northern Norway, including farming methods for that northern area, where fields are steep and small.

We were 250 miles north of the Arctic Circle, but coastal Norway is blessed with the presence of the Gulf Stream, so that the lowest recorded temperature at Tromsø is only 4 degrees F., and it has been known to get as high as 83 degrees. This relatively warm temperature permits the operation of coastal steamers, the so-called "hurtigruta"—express mail steamers—all during the year. We took the boat from Tromsø to Kirkenes, then crossed

Finnemark by bus before getting on the boat again at Hammarfest for the trip home. It was on the bus trip that I knew firmly that, like Linnaeus 230 years ago, I was in Lapland. For the rest of the description I am going to relate my experiences somewhat to his. From my own observations and from what I read in the Tromsø book, I'm convinced that the Lapp way of life has changed little since his day, although the concentration of the Lapps themselves is today more in the northern regions where I was, than in the areas through which Linnaeus traveled.

The Lapps are regarded as the oldest race in northern Norway, their ancestors possibly having inhabited some of the coastal areas as far back as 4000 years. Most people to whom I talked seemed to think that they are of central European origin. At any rate, since historic time began they have inhabited the northern tips of the four northern countries of Europe—Norway, Sweden, Finland, and Russia—and their racial characteristics flow so continuously over national boundaries even today that a special Nordic Lapp Council (not including Russia) attempts to solve their common problems. Today the Lapps, always nomadic herdsmen, stay pretty much within national boundaries, however, to avoid paying taxes to more than one nation, and only about 1500 of them still engage in the reindeer herding industry of their ancestors. In inner Finnemark, which we crossed by bus, the Tromsø book says that "the Lappish language and culture are still very much alive and set their seal on all aspects of social life."

When Linnaeus visited them in 1732 he was 25 years old, and was already a distinguished student of medicine at the University of Uppsala. The great professor of medicine, Olaf Rudbeck, also had charge of the university's botanical garden and had deputized Linnaeus as his assistant.

Association with Rudbeck is undoubtedly what inspired Linnaeus to travel among the Lapps. Rudbeck had visited them in 1695, but before he had a chance to publish his notes they were completely destroyed in a fire which in 1702 reduced most of Uppsala to ashes. Consequently, the natural sciences of northern Sweden as well as knowledge of Lapp culture were both closed files to the learned world. Linnaeus was given a small grant from the Royal Academy of Sciences when he promised to try to open them.

Among the pathetically few items he took with him on the long journey he made on foot was the diary which, in manuscript, can be seen today at the Linnaean Society in London. His handwriting was then as always such a tiny, scratchy scrawl that it amazes me that anyone ever deciphered it. And nobody did successfully attempt to do so until just prior to 1811, when it first appeared in print. This first edition was in English (it was not published in Swedish until 1889) and it was in English for an interesting reason. At the time of Linnaeus's death in 1783, the impoverished family offered all of the collections of the elder Linnaeus to Sir Joseph Banks, then

President of London's Royal Society, for £1,000. Banks referred the offer to a young and keen naturalist, James Edward Smith, whose father, a wealthy Norwich manufacturer, provided the money. In Sweden, a private effort was made, too late, to retain the collections and library. An appeal was made to the King to stop their export, but the brig loaded with the precious cargo had already passed the last Swedish customs post. The story of her pursuit by a Swedish naval vessel is now thought to be apocryphal.

But the "young and keen naturalist," Smith, made good use of his father's investment, and became a founder and first president of the famous Linnaean Society in 1788. Presumably it was he who had Linnaeus' Lapland journal translated. The actual translation was by a Charles Troilius, a young man described only as "in the mercantile line," but it was published under Smith's name, and the plant identifications in it are his.

Linnaeus left Uppsala on May 12th and on the 24th of that month reached Umoea, where he waited on the Governor of the Province of Westbothland, Baron Grundell. Linnaeus wrote about the garden there that "the red cabbage thrived very well . . . potatoes are not larger than poppy heads . . . broad beans come to perfection but peas, though they form pods, never ripen . . . roses, apples, pears, and plums hardly grow at all, though cultivated with the greatest attention."

At Umoea he was still far south of the area I visited, so I don't know what happened to Grundell's potatoes. Up where I was they were by far the most important field crop, and you didn't have to read the Tromsø Museum book to know it; they were served, cooked in two ways, at both lunch and dinner daily on the boat. Along with carrots, cabbages and cauliflower they account for 10% of all the agriculture of northern Norway, the other 90% being accounted for by the hay fields I saw all over. But this 90% is very little, since only 0.8% of the total area of northern Norway is under any kind of cultivation.

This fact would not have been news to Linnaeus, who wrote that:

"Hay is a very scarce article in these parts," and when he arrived at Jamtboht, near Umoea " . . . some women were sitting employed in cutting the bark of the aspen tree *(Populus tremula)* into small pieces . . . The bark is stripped from the tree just when the leaves begin to sprout forth, and laid up in a place under the roof of a house until the autumn or the following spring, when it is cut into these small pieces. . . . In this state it serves as food for cows, goats, and sheep, instead of hay." The reason for the shortage of hay Linnaeus gives as " . . . The fields consist principally of marshy tracts." For this I can vouch, even in the part of Scandinavia which I visited. It is sometimes called the "land of the bog-cotton," and when this plant is blooming it gives the marshy tracts a kind of fairy-like beauty I had never seen before.

But of course it was not cows, goats, or sheep that Linnaeus saw when he went farther north, nor was it among the Lapps I saw. Their grazing herds were and are reindeer—and I must say that seeing an enormous herd of them at the North Cape was quite an experience. Today it is said there are no wild reindeer left; reindeer have been the basis of the Lapps' economy since at least the 16th century and all today are domesticated to some degree and are privately owned. It is hardly believable that the statistics of this economy have not changed at all. Linnaeus wrote in 1732 that: "The riches of the Laplanders consists in the number of their reindeer, and in the extent of the ground in which they feed. The poorest people have from 50 to 200 of these animals, the middle class from 300 to 700, and the rich possess about 1000."

In a chapter in the 1960 Tromsø Museum book on the reindeer industry, it says: "It is usual to reckon the subsistence level for the average family of 5 members lies around 200 animals before calving . . . and according to returns made by the Lapp Bailiff in Finnemark, about 43% of the deer owners had over 200 head."

The Laplanders in Linnaeus' day, as now, ate the reindeer's meat (as I did, and found to be good), the reindeer's milk, from which they also made a cheese mixed with the leaves of sorrel *(Rumex acetosa)*. Reindeer skin without hair is used for gloves or in harnesses; with the hair on it is used for blankets, jackets and shoes. The leg tendons can be used to make cord, and Linnaeus found that the thread made from the tendons of 6 month old fawns was very pliable "and peculiarly fit for embroidery." In fact, he wrote, "I brought away a sample of it which I believe none of our ladies could match."

Linnaeus realized how all-important the reindeer were, and it disturbed him to see that: "The reindeer suffers great hardship in autumn when, the snow being all melted away during summer, a sudden frost freezes the *Lichen rangiferinus* (Cladonia, I think) which is his only winter food. When this fails, the animal has no other resource, for he never touches hay. His keepers fell the trees in order to supply him with the filamentous lichens that clothe their branches, but this kind of food does not supply the place of what is natural to him. It is astonishing how he can get at his proper food through the deep snow that covers it, and by which it is protected from the severe frosts. . . . When the frost is so intense as to form an impenetrable crust on the surface of the snow, so that the animal cannot break it with his feet to get at the lichen on which he feeds, he is frequently starved to death. . . . The reindeer fed with evident avidity on the great water horsetail *(Equisetum fluviale)* . . . though it was in a dry state, and though they will not eat common hay."

Linnaeus remarked further: "How unaccountably negligent are the Laplanders, not to collect in the course of summer a stock of this plant *(Equisetum fluviale)*, the great water horsetail, and of the reindeer-moss for winter fodder! They could then have some winter provision for the herd . . . and not hazard the loss of all they are worth in the world."

It disturbed him, too, that he

found extensive pine forests growing in Lappmark (Lycksele Lapland), but the trees fell and rotted on the ground. He could not even sell the simple idea of extracting tar or pitch from them—in fact, the only use he found in practice was that the Lapps made the outer layer of their bows from the wood of *Pinus sylvestria.*

These forests that disturbed Linnaeus remind me of a botanical fact that I thought interesting; whereas in the mountainous areas I know, the tree line is formed mostly by conifers, in northern Scandinavia there is usually a birch belt between the conifer region and the treeless alpine region. During my boat trip around the northern coast I saw no conifers at all, but when we crossed Finnemark by bus, we did see what is said to be the world's northernmost forest, in the Satbburdsdal Valley, just west of the base of Porsangerfiord. Strangely, there are very few spruces in northern Norway, and nobody seems to know the reason why. This is not the case, of course, in Sweden, where Linnaeus found most interesting uses being made of this tree.

In Pithoea he even found bread being made of spruce fir bark, because of a crop failure the preceding year. In Norway he obtained the recipe for such bread, and in Lulean Lapland he found that young bruised shoots of spruce fir, applied to the temple, were thought to relieve headache from "excessive drinking or any other cause." More generally useful, I should imagine, were the ropes made from the roots of spruce fir—with full instructions given.

He also speaks of the agaric of the spruce fir, used by Laplanders to smoke off the insect pests of their reindeer and themselves. Linnaeus also writes of the agaric of the willow (defined by Smith as *Boletus suaveolens*) being used as a perfume by young gentlemen calling on their lady friends.

Linnaeus lists innumerable other uses to which the Lapps put their plants: " . . . Birch bark is said to be used to make plates, boat scoops, shoes, baskets, and tubs in which to salt fish," as well as for "making ropes which will not sink in water. . . . When the Laplanders expect any visitors, they are particularly careful to have plenty of branches of the Dwarf Birch spread on the floor under the reindeer skins on which they sit; otherwise they would be thought deficient in civility, and the mistress of the family would be censured as a bad manager when the guests returned to their own homes."

Linnaeus found that the use of *Polytrichum* as both mattress and coverlet is an example of the "bountiful provision of Nature," since "nothing can be more warm and comfortable," as well as practical—the bedding is light and easy to carry about, and when it becomes too dry and compressed it is reconditioned by the addition of a little moisture. Lycopodium *(Lycopodium complanatum)* is useable for dyeing yarn. Sphagnum grows generously in the north, and I saw its peat, in Finnemark, used not only as fuel, but still visible in the construction of some of the first buildings the Norwegians put up when they returned to their land after the war. (The Germans, in their retreat, had destroyed every single bridge and building in the province.) The uses Linnaeus reports for sphagnum are different indeed—as a lining for Lapp cradles, covered over with a soft layer of reindeer hair, in which the babies lay quite uncovered. Powdered sphagnum, he says, has the further use of being "applied to excoriations in the skin of young children, while *Usnea* is applied to excoriations of the feet."

Various herbaceous plants are used, of course, for seasonings or foods of many kinds. The one that particularly intrigued me was a gigantic umbelliferous plant, *Angelica archangelica*, which grows wild in the area around and south of Tromsø and is so large one cannot miss it. The Laplanders scrape the young and tender stalks and eat them as a delicacy, according to Linnaeus, and they also mix its root with their chewing tobacco to give it flavor. I saw the plant growing in the fascinating economic garden at the University of Uppsala and was persuaded by the director, Nils Hylander, to taste a "young and tender stalk." For at least 12 hours thereafter my tongue burned so badly that I was convinced I'd been poisoned by this relative of the hemlock.

In conclusion I want to say that not the least delight of my summer was the Linnaeana that it led to. The meeting with Dr. Hylander came about because I was hunting for Linnaeus' summer home just outside Uppsala, at Hammerby. But ever since I came home it has been fun to read Linnaeus' account of his journey and to realize the amazing breadth of the mind of this 25 year old man. He discusses the insects, birds, fish and animals of the area he traversed as learnedly, I'm sure, as he does the plants there. Perhaps you'll say this is perfectly natural for a student of medicine and natural science, but he writes pages, too, about the Lapp marriage ceremony, and about the rules of a couple of games called Spetto and Tablut. And even when he sticks to the plant world for which we know him best, there is a charm that enhances his style.

FRIENDS OF THE GARDEN NOTES

The Tower Grove Shop is still open every day. There have been disturbing rumors that it opened only for the Christmas season, and Mrs. Frank Vesser of the Historical Committee reports that she has received calls from people who were wondering if there was still a Tower Grove Shop. There *is* a Tower Grove Shop, tucked away in an upstairs room of the Tower Grove House. It is open every day from 10 A. M. to 4 P. M., and has supplies for home gardening and flower arranging, English gardening tools, gloves, and aprons, books on flower arranging and other garden subjects, herb seasonings and vinegars, plus maps and books about old St. Louis and the surrounding Missouri countryside. Plan to come in and look around; there's no need to wait until next Christmas.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

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MISSOURI BOTANICAL GARDEN

Bulletin

February 1963
Volume LI
Number 2

GEORGE H. PRING RETIREMENT ISSUE

COVER: George Harry Pring, the Garden's superintendent retiring after 57 years at the Garden, answers one of the 50 calls a day he gets as St. Louis' favorite garden "Answer Man." During his retirement he will continue to be in the Main Gate office to answer garden questions every weekday morning from 9 to 12.

PHOTO BY BRIAN GORDON

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: BRIAN GORDON.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Vol. LI No. 2 February 1963

GEORGE H. PRING

THE newly appointed foreman in the orchid department at the Missouri Botanical Garden was being shown the Garden's collection of about 300 orchid plants. As they inspected the orchids the director said, "Tell me, what do you think of our orchid collection?"

The new man quietly answered, "Well, you haven't got much of a collection, have you?"

"Coming from Kew," the director replied, "I suppose you think we haven't, but you should have a big future, and one day we may even have a better collection than Kew." With that challenge, George Harry Pring began his career at Shaw's Garden. It was 1906, and he was just 20 years old.

Born in 1885 in Devonshire, he had just come from Kew, one of many "Kewites" whose training in horticulture had prepared them for careers all over the world. "Trained at Kew" meant the best possible education in horticulture in the early 1900's, and George Pring had been well trained. At 20, he was the youngest person to graduate from the famous Queen's School of the Royal Botanic Gardens at Kew. At the age of 14 he won a scholarship to work there as garden boy, sweeping walks and washing pots and waiting until the time when he could become a regular student. No one was allowed to enter Kew before the age of 21, but "Young George," as he was called, took the hardest examinations given at the school—physics and chemistry—to show he could do the work even though he was only 19. No one had given him permission to take the tests; so he was worried when he was called up before the supervisor, who had been informed that the gar-

"Young George," the future superintendent, as a garden boy at Kew Gardens, London. Age 14 years.

den boy had not only taken the exams, but had passed them with good marks.

Instead of the reprimand he was expecting, the boy was told that in his case an exception to the usual admittance rules was being made, that he was to be considered a regular student from that moment on. When he graduated from Kew the following year, he was still younger than any incoming student was supposed to be.

Mr. Pring, as he was now called, wanted to work for the Missouri Botanical Garden, which because of the St. Louis World's Fair was becoming known in London. He got the job as foreman in charge of orchids and exotic plants, and came to St. Louis. (The 300 orchids he found here in 1906 grew in not very many years to a world-famous collection of over 50,000 plants and 1200 varieties, surpassing or at least equaling the collection at Kew.)

He returned to Kew in 1907. During the trip across the Atlantic he met Isabelle McAdie, who was returning with her grandmother to England to visit relatives. The boat romance led to marriage in 1910, and Mr. and Mrs. Pring returned to St. Louis. Their four children are George, Charles, Bradford, and Isabelle. George and Charles both are horticulturists, and Isabelle is married to Dr. Russel Seibert, director of Longwood Gardens. All three sons saw service during the second world war, and Bradford was killed in the crash of a bomber in 1948, having flown 32 missions over Germany.

Mr. Pring began his work at the Garden as an orchid specialist, but around 1914 turned to breeding water lilies as well. He gives two reasons for his switch from orchids to lilies: First, to grow lilies from seed to bloom takes only a year, but an orchid takes seven years. Hybrid lilies can thus be produced sooner. Second,

RIGHT: Mr. and Mrs. Pring in St. Louis just after they were married in 1910.

Fifth from left in the first row is George Pring, shown with his class at Kew Gardens. He was admitted as a student even though he was not old enough after he took and passed the school's hardest exams.

The old St. Louis Cricket Club in Forest Park. Mr. Pring, at left in the first row, pitched for the team at Chicago and Philadelphia and was known as "The Fast Bowler." He also played soccer with Garden employees during lunch hour.

there were few if any horticulturists working with tropical lilies, and they provided a challenging field for experimentation.

He introduced the day-blooming Whitaker Strain from Africa, for which he received the National Gardeners Association Gold Medal in 1920. Other hybrids and more awards followed in quick succession. The first white hybrid day-blooming lily, "Mrs. George H. Pring," and the pink lily "General Pershing" brought awards in 1922 and 1923, but Pring's greatest discovery was the introduction of the Lost Yellow Lily from Africa. The famous "St. Louis" lily, the first yellow day-blooming hybrid, was a cross between the Lost Yellow Lily and the day-blooming "Mrs. G. H. Pring." "St. Louis" is the only lily of Garden creation that was granted a U. S. patent.

Some gardeners kept asking Pring why he couldn't develop lilies for small pools. After studying lilies from all over the world at the Kew Herbarium with an English collaborator, Mr. Bob Trickett, he obtained seeds of two pygmy lilies from Africa and began germinating hybrids. Two famous yellow lilies, "Aviator Pring" and "St. Louis Gold," resulted from these experiments. The final introduction which has satisfied home gardeners is the pigmy waterlily "Joanne Pring," which can be grown in a half barrel.

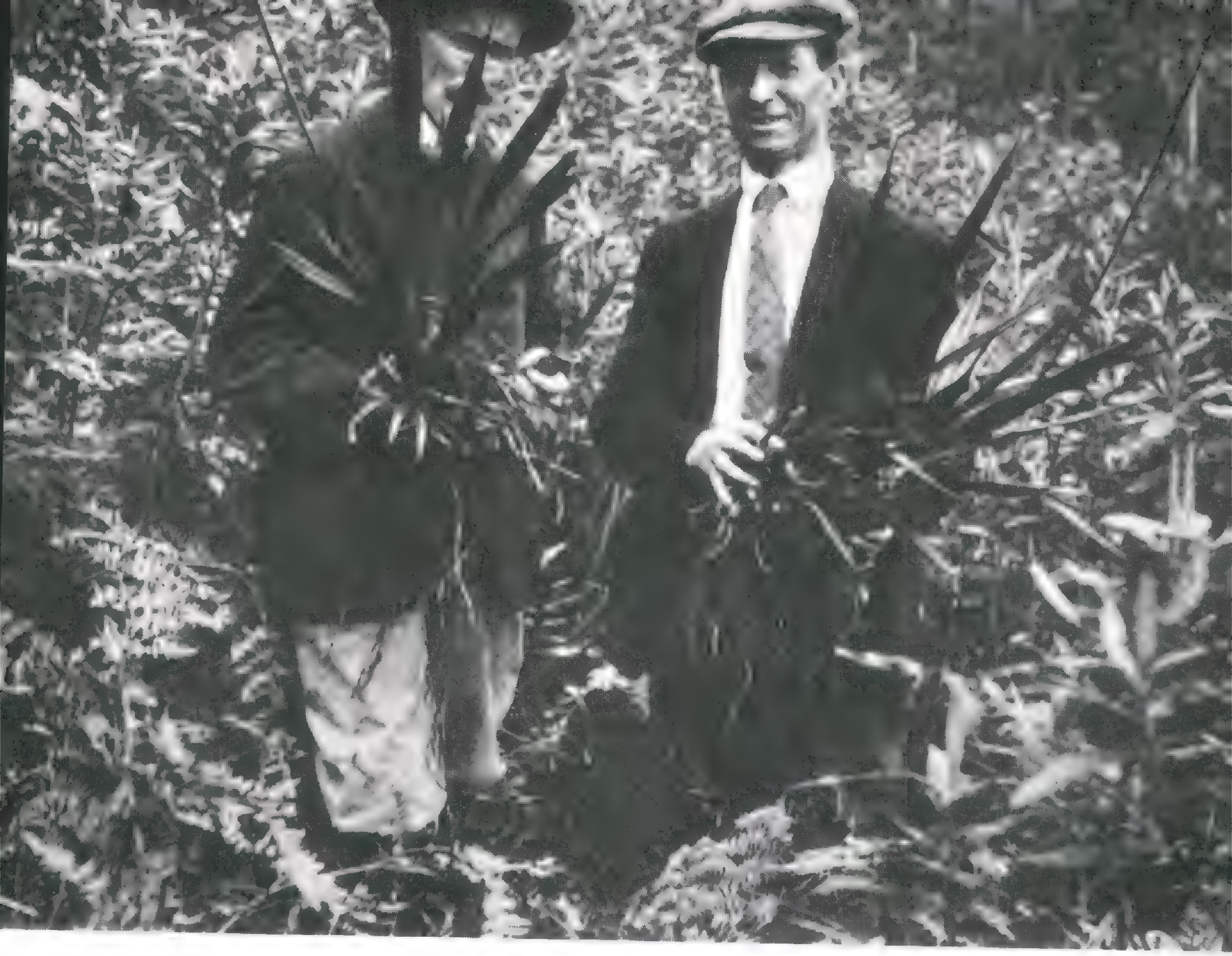
In 1923, having been appointed floriculturist and then the Garden's horticulturist, Pring went on an orchid collecting trip to Panama and the Andes of Colombia, returning after six months with more than 5000 plants. A later development in the Garden's history, the establishment of a tropical research station in the

Canal Zone, was an outgrowth of Pring's meetings with C. W. Powell, a collector of Panamanian orchids. Until it was sold, the Panama station was used for research in orchids and tropical plants.

It was in 1928 that Mr. Pring was appointed to his present position of Superintendent of the Garden, but the addition of supervisory duties did not keep him from continuing research on orchids and lilies. Visitors to the Garden have no doubt wondered why at times a man in wading boots would be carefully poking around in a lily in the middle of one of the large ponds, and why another man would be waving his arms over the flower. The man waving his hands would be Joseph Cutak, Pring's assistant, and the hand-waving would keep insects out of the way while Pring was pollinating the lily by carefully adding pollen which had been removed previously from another parent lily.

Superintendent Pring spends a lot of time answering gardening questions, most of them from St. Louis area gardeners, but many from all over the world. Each year brings more than 8000 requests for plant information, and Pring answers them with the experience that only a career as gardener can bring. During the March-to-September St. Louis growing season he finds himself confronted with telephone calls from people who want to know what to plant and when to plant them—garden flowers, bulb transplants and lawn seeding. Winter questions usually pertain to trimming shrubs and using mulch, but frequent-

Pring (second from right) and three other Garden employees enjoy a hand of cards and a four-way smoke from an unusual pipe. The picture was taken around 1910.



Above: Horticulturist Pring (right) with Cyril Allen collecting *Odontoglossum flavescens* in the Andes of Bogotá in 1923. The collecting trip took 6 months and Pring brought back more than 5000 orchid plants.

Pages 6 and 7: Superintendent Pring in waders pollinates a hybrid water lily. Lilies produced by Pring at the Missouri Botanical Garden are now found all over the world.

Below: The plants collected on the 1923 trip were carried down the Upper Magdalena River by raft.

ly there will be letters from school children preparing science projects and wanting information on plants Pring has done research on, or asking for information they cannot find in their textbooks.

Some people send or bring in plants for Pring to identify. Once a man came in from Illinois, dragging a poison ivy plant!

Each fall he expects to receive a number of calls from worried parents whose small children have eaten poisonous berries, and he gives the information to the family doctor as soon as he can.

Mr. Pring also finds himself appearing on radio and television to answer garden questions. Once a week each spring and fall he conducts a panel discussion on radio station KFOU's program "How Does Your Garden Grow," and on the KMOX program "Ask the Gardener." His first broadcast in St. Louis was in 1923 after returning from Colombia. At that time the broadcast studio was in a soundproofed room at Stix, Baer and Fuller downtown. When he returned to England again in 1950 as the first American ever to be elected president of the Kew Guild, he made broadcasts from the BBC in London.

He has become a popular judge at orchid exhibitions and is accredited by the American Orchid Society and the Men's Garden Clubs of America. As such he is qualified to judge any orchid information. "The Answer Man" and the "Gardener's Gardener" intends to

The Lost Yellow Lily from Africa, *Nymphae burtii*, which Pring introduced.

show in the country. He has also conducted two judging schools.

In addition to judging orchid displays, he has also organized many, in New York, Boston, Louisville, Kansas City and Washington, D. C.

Lecturing and writing have kept Mr. Pring busy throughout his career, and his articles have appeared in *Ladies Home Journal, Colliers, Life, Saturday Evening Post,* as well as in garden magazines. He has lectured all over the country on plant explorations, water lilies, insectivorous plants, and orchids. Many of the hybrid orchids he lectures about can be seen in the bouquet of the Veiled Prophet Queen each year.

There would not seem room for hobbies in such a busy life, but Mr. Pring has always had one or two. Cricket was his favorite aside from gardening, and he was known as "The Fast Bowler" when he pitched for the old St. Louis Cricket Club. When he had to give up cricket he continued his "hobby" of gardening, making it impossible to tell when he is working and when he is relaxing. The simple fact remains that his job is his hobby, and it always has been.

Mr. Pring will continue to be in his office at the Main Gate of the Garden weekday mornings from 9 to 12, for consultation, plant identifications and keep up a busy pace during retirement. He and Mrs. Pring will still live in their residence on Magnolia Avenue, and as Mr. Pring walks through the garden which has been his home for these 57 years, small children will no doubt continue to ask him, "Are you Mr. Shaw?"

LEFT: Superintendent Pring inspects a "George T. Moore" water lily, a medium-sized hybrid.

BELOW: The Prings celebrated their golden wedding anniversary in December, 1961, with a trip to Nassau given them by their children.

Missouri Botanical Garde

Saint Louis

In grateful

Recognition

of his distinguished career devoted
to botany and the arts of horticulture
throughout fifty-seven years at this
Garden, the trustees hereby confer
upon

GEORGE HARRY PRIN

the title of

Superintendent Emeritu

OF

The Missouri Botanical Garden

F. W. West.

aint Louis, Missouri, January 3, 190

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March 1963
Volume LI
Number 3

COVER: A student plants cuttings during a Saturday morning class at the Garden. Educational programs for children age 7–16 are held every Saturday from 10 to 11:30.

PHOTO BY BRIAN GORDON

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CONTENTS

Report of the Director for 1962

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MISSOURI BOTANICAL GARDEN
REPORT OF THE DIRECTOR FOR 1962

FRITS W. WENT, Director

The last year has been pregnant with anticipation for the Garden. Further preliminary plans were made for the construction of the Research Building, and very serious attention was given to the development of a cultural center at the Garden. Since both of these projects are of such great importance for the future growth of Shaw's Garden, it seems appropriate to analyze the rationale behind their construction.

If we try to see Shaw's original concept of creating a botanical garden in its true perspective, and in relation to the prevalent concepts of 80–100 years ago, then we have to admit that he was far ahead of his time. Most botanical gardens were parks planted with members of the different plant families; they were purely collections for the teaching of taxonomy. But from the beginning the Missouri Botanical Garden was not just a park (Henry Shaw created Tower Grove Park for the recreational needs of the citizens of St. Louis.) Nor was it a typically taxonomic collection; the herbarium served that purpose.

From the early days of the Missouri Botanical Garden there were a number of different types of gardens which are still perpetuated in the Linnean Garden, the Rose Garden, and the water lily pools. These special gardens were used for the demonstration of plant materials which could be used in home gardens. At an early stage greenhouses were built and collections of exotic plants played an important role then as now. A completely new aspect of the Garden was its tie with Washington University. Until then the great majority of botanical gardens were adjuncts to botany departments of universities. This relationship tended to make them very one-sided and as mentioned above they were largely taxonomical collections, and their horticultural, floricultural, and general educational aspects were neglected. The relationship with Washington University was to be different inasmuch as the director and top personnel were supposed to have scientific interests and therefore would want to have a formal connection with a university. This connection with Washington University also stressed another aspect of activities at the Garden, namely the research. This is an equally significant aspect of Garden activities. If we realize that only during the last decennia a general awareness has become established that research is essential for human progress and well-being, and that such a realization of the significance of research was practically entirely lacking a century ago, then its inclusion in the major activities of the Garden certainly was a far-seeing policy which afterwards was accepted by many other botanical gardens founded since. A further aspect of the development of the Garden was the teaching both of students and of practical gardeners. It is significant that in the years immediately after Henry Shaw's death when the first annual reports of the Garden were being published, as much as 25% of the Garden income went to research activities. This is significant because even in universities where research first achieved standing, certainly a much lower percentage of income went into research at that time. Big industrial concerns which today spend 10% or more of their income on research had in those days no research departments at all. This all tends to indicate to what extent Henry Shaw and the newly founded Missouri Botanical Garden were ahead of their times.

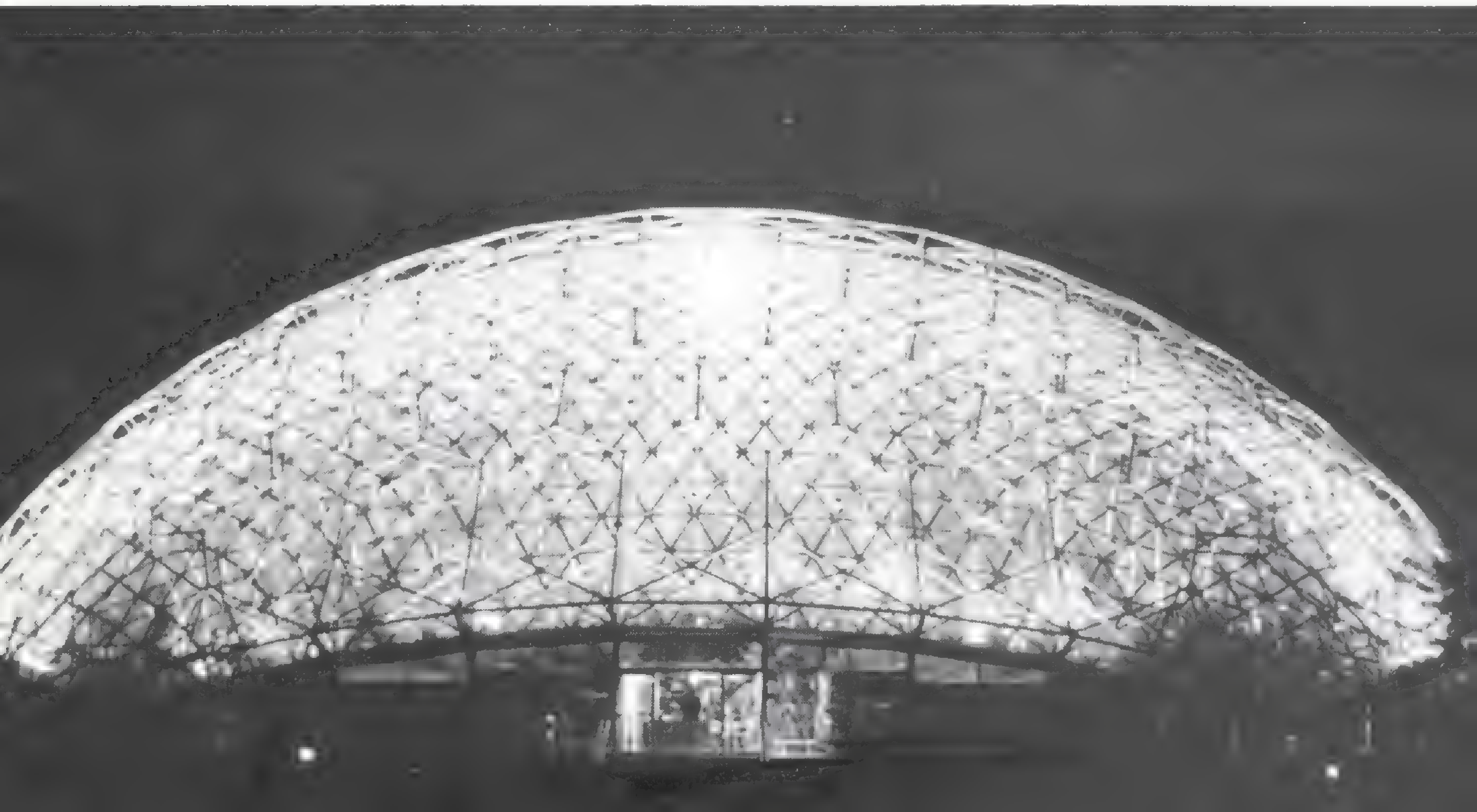
When reading the reports on the Herbarium and Library, one will see how desperately they need improvement and more space. This need is even more pronounced for experimental research. The director feels frustrated because of the almost complete lack of laboratory facilities, which were envisaged in the master plan for Garden development, and the construction of which received number one priority after completion of the Climatron. Actually the delay in construction of the Research Building is jeopardizing obtaining the $438,281 which the National Science Foundation and the National Institutes of Health have made available for its construction.

Hopefully, new preliminary plans for the Research Building have been made by our architects, Murphy and Mackey. For this building a site just north of the present Floral Display House has been selected. This location would bring herbarium, library and research laboratories in close proximity to the most intensely developed parts of the Garden and to the greenhouses, where most of the plant materials needed for research would be found. It would bring together the taxonomists, experimental biologists, administrative, teaching and maintenance staff, allowing a much closer collaboration between all different parts of the Garden. The contemplated laboratory facilities would make it possible to start again the orchid breeding work for which the Garden has been famous for a long period, but which had to be discontinued during recent years because of lack of facilities. The need for more herbarium and library space becomes more pressing with each passing year, and we are passing up many research possibilities and potential research grants through lack of laboratory space. The present "Experimental Greenhouse" has become entirely inadequate for modern research.

The upkeep of a botanical garden is very expensive, largely because the maintenance of good plant collections requires many well-trained gardeners. In most other botanical gardens this maintenance work is paid for by city, county, or some other government. With the large number of paying visitors to the Climatron it became clear that if Garden facilities were of sufficient general interest, the public was quite willing to contribute to its cost through admission fees. This is true for the Tower Grove House as well, which at present is being maintained almost exclusively from income derived from admission fees. With these examples in mind, the future development of the Garden was considered in terms of income-producing activities which would bring sufficient income to provide maintenance funds for those facilities and the Garden in general. Such facilities would have to include exhibition spaces in addition to our general flower display, restaurant facilities and parking space. For a botanical garden with its major attendance during the day, parking lot and restaurant would be used mainly during daylight hours. To make them fully effective, night activities should be considered. Since this conclusion was so obvious, the concept of having a concert hall and other cultural activities became a logical sequel. In such a way the parking lot and restaurant and exhibit spaces would do double duty, during the day mainly for the Garden, and at night mainly for the other cultural activities. However, it was not entirely, or even primarily, utilitarian considerations which suggested Shaw's Garden as a general cultural center. It became immediately apparent that the surroundings which Shaw's Garden had to offer would be an invaluable asset to a cultural center. Conversely, the patrons of such a cultural center would become more acutely aware of the Missouri Botanical Garden and its possibilities, and thus a mutual stimulation seemed inevitable.

Of equal importance in considering a cultural center is a further study of Henry Shaw's will. He considered the possibility that at some time the income from his endowment would be insuf-

The Climatron is now a familiar but still exciting St. Louis landmark.



ficient to maintain the Garden the way he had conceived it. Therefore in the third paragraph of the uses to which the Trustees can put the Garden property it says: "3rd—The residue of the real estate not required for the immediate purpose of the said Botanical Garden . . . shall from time to time . . . be leased by said Trustees as follows"; (then come some sentences on the leasing of land for building purposes). "It is my design and object not only that the lands so leased shall afford an income or revenue for the support of the said Botanical Garden, but that it may in the future be so leased as by its improvement its contiguity may be pleasant and attractive to the visitors and students of the Botanical Gardens."

It is quite obvious that Shaw was contemplating income-producing activities on land not immediately needed for garden purposes, and that these activities should provide an added attraction to Garden visitors. The Cultural Center, which would require only a small amount of space in addition to the facilities which we have to develop anyway for the Garden, seems therefore a completely logical development in view of Henry Shaw's wishes.

The further economic development of the Garden requires that we combine with compatible evening activities. If we do not join with the Symphony Association or a theater group, we will have to develop our own evening shows and music. It all would have to be of a cultural quality. We could think of activities like those of the Art Museum, but then we would be in competition with it. Or we could try to go back two centuries and develop science demonstration lectures, which might bring us into competition with the St. Louis Academy of Sciences. So then we arrive at music programs which, if properly arranged, would not compete with any existing organization if we emphasized folk music, band and chamber music. In this way we might attract both South St. Louis and the Italian population.

There always will be music. If the Symphony Association wants to take the initiative, so much the better. If not, Washington University, the Little Symphony (only during summer), the Civic Opera Association and any other groups will take over; the Garden certainly will, in conjunction with The Hill and South St. Louis. Thus the prediction of Alfred North Whitehead, the noted philosopher of Harvard University, will become a reality: "The only place I know where European man can still create civilization on the grand scale is in the American Midwest." For he says of the Midwest: "It has a human soil further favorable to a new civilization: not only is it a self-selected stock; the people in small towns still hold a favorably large proportion, as compared with the population of cities. Man's best thinking is done either by persons living in the country or in small communities, or else by those who, having had such environment in early life, enrich their experience by life in cities; for what is wanted is contact with the elemental processes of nature during those years of youth when the mind is being formed." Earlier Whitehead said: "We educated people have our æsthetic sense too highly cultivated and do not come to beauty simply enough . . . The only place I see where another great flowering of European culture might come is in the American Middle West, where the start could be fresh and from the ground up." . . . "Americans must not copy Europe. They must be themselves, must create *de novo.* These American imitations of Europe will always lack interest and vitality, as all derivations do. Let Americans study Europe and see what has been done. But when it comes to creation, God bless my soul! then forget everything that has ever been done before, and create!" . . . "Once learning solidifies, all is over with it."

We definitely believe that the further development of the Missouri Botanical Garden is one of those new creations which will renew culture in its broadest sense. It will be involved in all activities in which the senses are involved: ear, eye, touch, tongue, nose, and mind, such as are not in existence anywhere in the world.

Among the most important happenings of the year was the retirement of Mr. George Pring, who completed 57 years of loyal and devoted service to the Garden, first as foreman in the greenhouses, and later as floriculturist and horticulturist, until in 1928 he became superintendent, a new position created specifically for him. Mr. Pring has retired with the title "Superintendent Emeritus" and everyone hopes that for many years more he will continue to help the Garden, especially through its information service.

In August, Mr. William Rebbe was appointed Superintendent of Operations and during his first half-year with the Garden has familiarized himself with its general operations—he is now providing overall directions of operation. At the same time Miss Edith Mason and her draftsman, Mr. William Steavenson, also became connected with the Garden. Miss Mason, who is a graduate of the Garden, has been very busy with new developments which will be installed as soon as plans are completed and funds are released by the Trustees. Through generous gifts of Mr. John Lehmann such funds for further developments are actually available. Another important activity of Miss Mason was to develop a general survey map of the Garden, which makes it possible to establish for the first time the location of all trees and other plantings.

Last autumn the Garden was officially made one of the test gardens of the All-American Rose Selections, Inc. A variety test garden is being laid out where commercial growers can have their new and unnamed roses tested and compared. From these tests throughout the country, the All-America Rose Selections are made. It is believed that this rose testing program under the direction of Mr. McMath is a significant activity because roses are probably the most important garden flowers in this part of the country.

Mr. Ray Freeborg has been employed by the Garden as a grass specialist through the cooperation of the St. Louis Turf Research, Inc. He has been laying out test plots for lawn grasses of many varieties. In this way the public will be able to evaluate the relative merits of the various grasses before planting them in their own yards. Unfortunately, the connection between the Garden and St. Louis Turf Research had to be discontinued by the end of the year, although we expect that in some way Mr. Freeborg will retain his connection with the Garden.

During the year important progress was made in our music reproduction program under the leadership of Mr. S. Shure. In addition to the gift of over one thousand records, much music was transferred on tape and thus an extensive music library is in the making. One-hour-long Climatron concerts are played twice daily; the selections are changed every week. A set of four large speaker systems has been constructed; an amplifier and tape-reproduction system which produces music of the highest quality could not be purchased as yet. But the try-outs with this system were highly successful.

In January the Garden received a special citation from the Horticultural Society of New York, namely: "Distinguished Service Award to The Missouri Botanical Garden for outstanding contributions to the advancement of Horticulture."

The ninth annual Symposium on Systematics, "Quantitative Systematics," reviewing recent developments in the use of electronic computers to anaylze the many and complex factors of plant relationships, was held at the Garden October 18 and 19. Dr. Robert Dressler was in charge of arrangements and more than 350 botanists and zoologists from educational and research institutions attended. Many of these were teachers who each year bring groups of their graduate students. The Symposium has been supported by grants from the National Science Foundation for the past nine years.

The Women's Association, under the able leadership of Mrs. Bruce Butler, continued its invaluable support of the Garden. As in the recent past, this year its principle activity was the Garden Gate Sale, held in the spring at the Famous-Barr Clayton store. The extraordinary competence which these ladies bring to the complex logistics of this sale is always impressive, and this year, by extending the sale from three to five days, they added to their problems and to their profits. Even if the net profit from the Garden Gate were zero, it would still be of great benefit to the Garden as a result of all the interest it attracts, and the fact that it enables the Women's Association to make a substantial gift to the Garden each year even further emphasizes the importance of the women's work.

The Historical Committee regretfully accepted the resignation of its first chairman, John S. Lehmann, who was, happily, replaced by Leicester B. Faust. The high point of the year for the Committee was probably the opening of the new Garden Shop on the second floor of the Tower Grove House. Attractively designed and decorated, the shop offers unusual and interesting garden accessories and implements, and contributes to the characteristic charm of the House. Evidence of even further stirrings of imagination and enterprise among the Committee members is the prospect that early 1963 will see the appearance of the Shaw's Garden Cookbook, sponsored by the Committee. Its prospectus sounds most attractive and it may be anticipated that it will be another solid contribution to the Garden's good name and fame.

Early in the year the Garden Clubs of St. Louis and Ladue entered the Founder's Fund Award competition of the Garden Club of America with a proposal to construct a Mist Forest in the Climatron. So persuasive and enthusiastic were the members of these two clubs, and especially Henry Hitchcock, who made the final presentation in behalf of the project, that it won the Award against stiff national competition. Funds to match the Award have already been pledged, and it is hoped that in the first part of 1963 construction on this important new attraction in the Climatron will be underway.

Another significant gift received during the year was from Mrs. Owen J. Sullivan, designated for construction of a drinking fountain in the Garden in memory of her late husband. The Landscape Architect has selected a location and completed design work on the fountain and its setting, and construction will be completed in the spring of next year.

During the year the Director gave many lectures, some in the St. Louis area and others in Pullman, Washington; Eugene, Oregon; Camden, New Jersey; Urbana, Illinois; New Haven, Connecticut; Miami, Florida; Terre Haute, Indiana; Sydney, Canberra and Perth in Australia; and Elsa, Illinois. He gave a special lecture series at Vanderbilt University in Nashville, and at the State University of North Carolina in Raleigh. Both in New Orleans and in Honolulu the Director was a member of committees to evaluate the possibility of developing a botanical garden and in making specific recommendations. As a member of a committee for the University of Alaska to make recommendations on the need for biological research on arctic problems, twice he spent a week in Alaska.

In connection with the possibility of developing research and teaching in the tropics, he attended two conferences, one in Costa Rica and one in Trinidad. These opportunities were used to bring many local orchids back to the Garden to increase our greenhouse collections. This was also done with orchids from New Guinea. In August and September the Director and Mrs. Went visited Australia, first to attend the ANZAAS meetings in Sydney, and afterwards a Phytotron Conference in Canberra, where the new Australian phytotron named CERES was officially opened. It was a very rewarding experience to see how the work started in Pasadena in the Earhart Plant Research Laboratory was coming to fruition in other parts of the world. Immediately after the conference in Canberra, the Director spent 2½ weeks in western Australia, where he studied the remarkable sclerophyll scrub vegetation and brought back a large herbarium collection. Afterward he spent 2½ weeks in New Guinea, where the Director of the Botanical Garden in Lae, Mr. J. Womersley, had arranged for several expeditions in the mountain areas of central New Guinea. Again he collected a considerable number plants for the herbarium.

During the year the Director was President of the American Institute of

Biological Sciences. Because of the critical financial situation of this organization this office took considerable time.

In addition to his administrative duties, Hugh Cutler, Executive Director, continued his research on useful plants, supported by a National Science Foundation Grant. In February and July he visited Utah as part of studies being done with the Museum of Northern Arizona and the University of Utah on resources of the Glen Canyon area of the Colorado River. Michael Wynne continued as technical assistant until June. He began his training in the first children's education programs at the Garden, studied and worked at the Garden while a high school student, then won a four year scholarship to Washington University. He is now doing graduate work in botany at the University of California. Marcia Eickmeier, another graduate of the Garden's children's programs, was appointed to the position of technical assistant in September.

During February and March, Dr. Cutler and Dr. Thomas Whitaker of the Department of Agriculture were in Tehuacan, Mexico, at the invitation of the R. S. Peabody Foundation to study plants of the squash family. Dr. Cutler took part in late March in the conference of Directors of Systematic Collections in Washington.

THE HERBARIUM

ROBERT E. WOODSON, CURATOR

THE herbarium of the Missouri Botanical Garden — the fourth largest in size in the United States and one of the major botanical museums of the world—is continuing its alarming decline of the past twenty years or more. Its facilities are crowded to the point of sheer desperation; it has not a single full-time employee charged with its administration and maintenance. Despite this, the herbarium, together with the library, is the basis of the Garden's claim as a scientific institution and a major contributor to graduate and staff research of the Henry Shaw School of Botany of Washington University. The herbarium's situation has now reached a point where a realistic program for its solution must be undertaken within the next year if it is to be preserved as a substantial asset.

During the current year the herbarium accessioned 2,863 specimens, bringing the estimated total to 1,779,273. 6,309 specimens were issued on exchange to similar institutions in the US and abroad; 5,646 specimens belonging to us were lent to sister institutions, and we borrowed 4,552 specimens for study by our students and staff.

Research topics of staff and students were essentially the same as during 1961: Dr. Robert E. Woodson, Jr.—flora of Panama and *Asclepias tuberosa*; Dr. James A. Duke—flora of Panama; Dr. Carroll W. Dodge—Antarctic and African lichens; ~~Dr.~~ Robert L. Dressler—Orchidaceae; Dr. Calaway Dodson—Orchidaceae; Dr. John D. Dwyer—Leguminosae, chiefly of Panama; Mr. Gordon Hunter—*Saurauia*; Mr. Howard Pfeifer—*Aristolochia*; Mr. Phung Trung Ngan—*Wrightia*; Mr. Leonard Thien—*Barkeria*; Mr. Michael Wirth—*Oncidium*. Dr. Duke has been in Panama since late May in the service of the U. S. Army Ordnance program. Dr. André Robyns of Brussels arrived in November to spend nine months in the herbarium assisting with the flora of Panama (Bombacaceae, Tilliaceae, Sterculiaceae).

THE LIBRARY

GEORGE VAN SCHAACK, Librarian

The library report for 1961 was largely devoted to describing the conditions of overcrowding in the library and the lack of sufficient staff to deal adequately with acquisition of new material and care of the older. Since in these matters there has been no improvement during the past year, the report for 1962 must bring them back into focus even more clearly. Stated rather bluntly, if a scientific tool such as an electron microscope or a museum piece such as a Cézanne painting were to be given treatment comparable to that now received by the library's collections, the informed community would be disturbed. But certainly the Garden's library is a comparable scientific tool and at the same time contains a significant number of items of a museum character, not art objects perhaps, but objects of equal cultural importance.

The classification of plants is fundamental to all other plant studies and it is one in which the Garden has been prominent ever since its founding a hundred years ago. In this study it is necessary to make direct reference to the original descriptions of all the plants under review. In classifying a genus of a hundred species, it may be necessary to consult several hundred such references scattered throughout scientific publications of the past two or three hundred years. Taxonomists working at the Garden have regularly been able to find 95 to 100 percent of these references in its library—in brief, the *library has been a sharp scientific tool*. But it is going to be blunted unless there is more space for new material, more staff to handle new material, and more time and money available for rehabilitating the perhaps 20,000 volumes in bad physical condition.

Of the items which contribute to the museum aspect of the library the more important groups are the pre-Linnean collection of botanical books printed from 1474 to 1753, the collection of Linnaeus' own works, the collection of illustrated flower books of the 18th and 19th centuries, the Engelmann notebooks and correspondence, and the Sturtevant notebooks and index. To some extent nearly all of these are still scientifically significant; all of them are important for the history of science. Many are also noteworthy for other culturally important reasons such as printing, illustration, and exploration. Nearly any one of these items has value in itself, but here the whole is greater than the sum of its parts. Any single edition of Miller's *Gardeners Dictionary* can give a fairly good idea of what plants were being grown in England during the 18th century and what their culture was. But there were some 25 editions (including translations) of this popular work which appeared from 1731 to 1807, and the history of gardening in England for that period must have reference to at least several of them. The Garden's collection contains 19 editions, each of them increased in usefulness by the presence of the others—in the original English or in German, Dutch or French translations, all of Miller's work under this title is here. The Linnean collection contains not only some edition of each of his major titles, but for practically all of the titles, one or more issues of nearly every edition.

Solely for scientific reference many of the works such as those just mentioned might be almost as useful in some micro-reproduced form, since they are largely without illustration and the text is equally meaningful whether read from the printed page or from a projected image. But at least for the older works, especially those with important associations, no copy can substitute for the original if anything more than a mere piece of information is being sought. This is universally true for the hundreds of works illustrated with hand-colored engravings. No process of reproduction now known or contemplated can provide copies of these suitable for anything beyond mere reference. The special qualities of the engravings and the special hues and textures of the colors would be lost entirely in machine reproduction. The museum character of these books must not be forgotten. Many of these volumes can not be consulted without damage—their bindings are weakened, their covers loose or even detached, and their backs broken. They often weigh up to 15 pounds or more; to consult them, one must pull them from the shelf against the pressure of adjacent heavy volumes and carry them through a too narrow corridor to an inadequately lighted table too small to accommodate them. Truly responsible curatorial conduct here would require locking the doors until conditions are bettered.

Search for a new trained staff member was no more successful than last year, apparently for the same reasons. Competition for knowledgeable personnel is not getting less keen and our chances of attracting good assistance are considerably lessened by the really difficult working conditions and by the lack of a pension system and regular schedule of advancement.

The backlog of uncatalogued material markedly increased during the year and only 141 new non-periodical titles were catalogued. The decrease here is partly counterbalanced by a reclassification of the horticultural section. This 'little' job proved much more extensive than contemplated, but as things stood the classification had become so amorphous it was not possible rationally to assign a class to any new title in the horticultural area. The new scheme is largely *ad hoc* and leaves much to be desired, but it is usable for both librarians and patrons; the other was not.

Books bound totaled only 246, less than 40 percent of last year's number. Lack of good working space makes the preparation of books for binding doubly difficult, an operation expensive in time under the best of conditions. Time to prepare several hundred more journal volumes for sending to the bindery was not available. Repair of books on the premises continued on a part-time basis, as in the past, still under the care of the young man who has worked for us for several years. He has become quite skilled and has put hundreds of our volumes back into sound shape; unfortunately we can not keep him for much longer, for he has finished his training in commercial art and will soon take full time employment in that field. It will not be easy to replace him.

CLIMATRON AND GREENHOUSES

LADISLAUS CUTAK, Superintendent

In the world's jungles, hundreds of plants grow in companionship with each other and nowhere else will one see such a concentration of plant life. In the conventional greenhouses of botanical gardens most specimens are grown side by side in level beds or borders, thus minimizing the beauty of such plants under artificial plantings. In the Climatron, with its split-level contours, the landscaping has been done on more natural lines. Thus, visitors to the Climatron can see practically the same conditions that would be found in a natural jungle in Malaya, the Amazon valley, or equatorial Africa.

The plants in the Climatron have grown so rapidly that their magnificent growth has greatly diminished the intensity of the perimeter lighting system, although it was never intended to brighten up the interior with this illumination alone but rather to dramatize the exterior look of the plastic and aluminum dome. However, the perimeter lights originally did produce a great deal of light for the interior when the plants were small and first set out. In the future, as the plants reach maximum heights and density, more spotlighting of areas will have to be arranged.

A year ago, photographs taken in the interior of the Climatron always showed the intricate lacy framework of the geodesic structural dome but now this is almost absent from the pictures unless the camera is pointed directly upward. Photographers have found the Climatron highly photogenic and many striking pictures were published in both St. Louis newspapers, as well as in national magazines. Frequently the manufacturers of dinnerware, ladies fashions and other goods used the settings in the Climatron as attractive backgrounds for advertisements.

New plants have been added to the collection in the Climatron from time to time, many of these gathered by members of the staff on collecting trips, or as exchanges from botanical institutions. Friends of the Garden also donate plants when these grow too large for home space available. The Clayton Inn, for example, gave the Garden five fair-sized Piccabeen palms *(Archontophoenix cunninghamiana)* when they grew too large for the lobby. The Piccabean is a tall unbranched palm native to forest regions of Queensland in Australia, where it often reaches a height of 80 feet. Several marcots (cuttings made by air layering) of the interesting chocolate tree *(Theobroma cacao)* as well as the mother plant were set out in the beds after it was severely pruned for transplanting. The mother tree ought to be producing flowers and possibly cacao beans in 1963. Two small plants of the breadfruit *(Artocarpus incisa)* were shipped from the Foster Botanical Gardens of Honolulu, and when fully grown should add elegant beauty to the Climatron scenery. This is one of the ultra-tropical trees introduced by Captain Bligh of *Bounty* fame into Jamaica to help feed the slaves (although they refused to accept it, preferring the banana instead).

The akee *(Blighia sapida)* is still another important tree in the Climatron. It was named for Captain Bligh although he had nothing to do with bringing it from Africa. Visitors will find it growing on the miniature mountainside just across from the tropical bog in the northeast section near the tumbling stream which forms the waterfall. This tree is about ten feet high and eventually it will produce brilliant lacquer-red fruits.

The banana grove, which once took up one-third of the Hawaiian area, was reduced after the plants bore fruit. During the summer and into winter, visitors were treated to the sight of ripening bananas on the giant plants—a sight very seldom seen even in commercial plantations, since the fruiting stalks must be cut off green and ripened artificially for foreign markets. Small papaya trees near the entrance made a display of orange-colored fruits in the months of June and July. The papein of commerce (for tenderizing meat) is secured from the juice of the papayas. Many other commercial plants can be found in the Climatron's collection, including the sugarcane, pineapple, tapioca, mahogany, and rubber.

Probably the most significant plant received during the year was *Welwitschia mirabilis* from the deserts of tropical Africa. Several seeds of this remarkable plant were donated by the Los Angeles State and County Arboretum, which got them directly from southwest Africa. The seeds were first soaked in water for three days and then sown directly into the 3-ft.-long sewer tiles filled with Meramec sand. Germination occurred in less than two weeks, when three seedlings made their appearance. Two of these are now growing nicely, but one died during transplanting when the pipe was accidentally broken. The *Welwitschia* is perhaps the most unusual member of the entire Gymnosperm class (plants producing naked seeds), and is restricted to the deserts of southwest Africa. It is a slow grower; from germination and for many years afterward the plant develops a large underground taproot which stores water and food for the plant's subsistence. The crown of the root is just above the sand surface and produces two narrow strap-shaped opposite leaves, which are the only ones produced by the plant in its lifetime. These two leaves will continue to grow at their base and eventually will become elongated and twisted. In nature the tips become torn and shredded by desert storms.

Another rarity, this one on public view on one of the artificial trees in the Climatron, is *Myrmecodia armata,* a small subshrub native to Malaya. It is a far cry from the coffee tree to which it is related, but can be readily spotted by its greatly swollen basal stem or tuber, which is dull gray, tuberculate and spiny. In nature it grows as an epiphyte on trees and is considered myrmecophilous (ant loving), since certain kinds of ants nest in excavations that they make in the great tubers. What relation really exists between the animal and plant has never been satisfactorily determined although many theories have been expressed.

Still another interesting plant put on exhibition is *Dischidia rafflesiana* or ear vine. It is a succulent climbing milkweed from Malaya producing two types of leaves, the most noticeable being pouchlike inflated organs which attract insects.

As the Climatron was being built and planted, the two desert houses had to be temporarily given only the barest attention. During the past year an attempt was made to clean up, prune, and replant the houses, as well as catalogue the plants. Most of this work has been completed and both the cactus house and South African house present a satisfactory appearance. The aroid house was cleared of most of its plant material, some of it being incorporated in the Climatron and others planted in tubs.

The exotic growing ranges have received their share of improvements also. For a number of years, plants were distributed haphazardly wherever space was available because of existing conditions at the time. Now a concerted effort has been made to localize the important plant groups, and thus aroids, bromels, cacti and succulents, ferns and new introductions are more readily available for study, discussion and final placement in permanent plantings.

The waterlily pools were plowed and fertilized as usual prior to their planting in the first week of May, and they again gave a gorgeous display of blooms throughout the summer and fall seasons. Tubers of our famed hybrids were sent to East Pakistan, Indonesia and New Guinea to stock outdoor pools, while surplus plants were given to the state fair in Sedalia, and the State Capitol at Jefferson City.

EDUCATION PROGRAMS

EDUCATION and research are the two activities which more than anything else distinguish a real botanical garden from a park. Both of these activities are seriously limited at the Garden by the lack of facilities and adequate staff. In spite of these limitations the educational activities have continued to improve and to grow. Careful scheduling for classes, meetings, work sessions and lectures in the Museum and the Research Greenhouse and the addition of more outdoor areas for the Pitzman Summer Nature Program have made it possible for more groups to find space. Trained volunteers are becoming more and more adept at leading special classes and tours, and more children who have taken part in past programs are able to help children who are beginning their participation in Garden programs.

CHILDREN'S ACTIVITIES

KENNETH PECK, INSTRUCTOR

More than 500 children registered for the fifth year of the Pitzman Summer Nature Program. Over two-thirds of the children attended most of the classes and did the work required for certificates. The classes in bird-study were conducted by Mrs. Eva Kirkpatrick, Mrs. Cecil Criger and Miss Kay Stewart for the St. Louis Audubon Society. One of the class projects was the construction of a simple battery-operated bird identification board. The other classes were conducted by Kenneth Peck, Pat McCue, Jerome Arter, Jean Bardenheier, Marcia Eickmeier and James Wuenscher. The hard work of preparing materials was done by Fred Bardenheier, Stanley Ulrich and Wesley Ulrich. Many of the children who came this year attended the programs last year and some have been coming for three years. This year more children participated on Junior Research Teams, groups which worked together to study problems such as vertical distribution of seeds and organisms in an open field, the effects of environment on seed germination, identification and control of lawn weeds, the anatomy of fish, collection and preparation of edible wild plants, and methods of land management. Most of the staff members showed the work their groups were doing on nine television appearances with the Charlotte Peters Show on KSD-TV.

Saturday morning activities for children have grown in the five years since their inception. These programs are held every Saturday morning from 10 to 11:30 and no advance registration is required. Our aim is to stimulate an interest in natural science by having children do things which usually are related to basic ideas in natural science. Some of the most popular subjects are propagation of plants from seeds or from cuttings, making Christmas decorations from wild plant materials, and identifying trees. The Research Greenhouse has room for only a few more than 100 children to work, so the 275 children who came to plant miniature gardens had to be divided into groups and take their turns.

Thirty-two children planted vegetables last summer in a trial run of a vegetable garden program. Each of sixteen plots was planted, weeded, and harvested by two children. Tomatoes (Burpee's Big Boy and Marglobe) were the best crop and the average yield was about 32 pounds from each plot. Peppers, onions, string beans, lima beans and a few flowers were also grown.

The Plant Science Program, now in its second year, was used by most of the schools within walking distance of the Garden, and by schools which could obtain transportation. Children in fifth through eighth grades are given lectures and demonstrations in botany at a level suited to their grade. Programs range from simple identification of plants for the fifth grade to studies of plant communities and plant geography for the eighth grade. Teachers who want to bring their classes may call Mrs. Florence Guth (TOwnsend 5-0440) to make appointments. In October about 200 children from neighborhood schools visited the Garden to plant narcissus bulbs which they took home.

Tours were conducted for many classes, Scout groups, and adult groups by our own staff and by a well-informed group of volunteers working with Mrs. Paul Britt. Mrs. Britt has been in charge of the tour guides since this service was begun nearly ten years ago. The Climatron continues to be the biggest attraction.

Adult courses were conducted by Clarence Barbre, Raymond Freeborg, Robert Gillespie and Kenneth Peck. *Preparation and Care of Lawns*, given by Raymond Freeborg, the Garden's turf specialist, was so popular that additional sessions had to be arranged. Mr. Freeborg and Dr. Edgar Anderson also conducted the annual Grass Walk in June.

Attendance at the First Monday Lecture Series increased. Six free public lectures were given by staff members.

Over 20,000 self-guiding Tree Trail leaflets were used by children and adults to find their way to 40 kinds of trees.

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ACTIVITIES IN THE FLORAL DISPLAY HOUSE

PAUL A. KOHL, Floriculturist

METROPOLITAN Opera district audition winners were announced at a reception of the St. Louis Grand Opera Guild in the floral display house on January 14.

The preview of the annual orchid show for the Friends of the Garden was held on the evening of February 1. The show continued through the month of February, and on Wednesday, February 21, it provided a fine setting for the first of a series of Indonesian dinners prepared by Henry Falkenberg.

Five thousand tulips in ten colorful varieties were on display from March 11 to 18. On the weekend of March 24 and 25 the African Violet Society staged its annual show.

During April the spring flower show drew more visitors than any of the other shows of the year. A total of 43,772 visitors came to see the azaleas and the great variety of colorful cinerarias, calceolarias, cyclamen, genistas, lilies, nasturtiums, hyacinths and tulips.

May 5 and 6 a joint show was staged by the Missouri and St. Louis Aquarium Societies. Lady Washington geraniums were displayed for a week and then were followed by the spring flower show of the St. Louis Horticultural Society, on May 19 and 20. The Rose Society of Greater St. Louis held its spring show May 26 and 27.

Hydrangeas were shown during June, and in the summer months foliage plants and caladiums occupied the flower house. June 30 the Greater St. Louis Hemerocallis Society had a one-day show in the north end of the display house.

The Chrysanthemum Show was designed around a Japanese motif.

The Illinois Gladiolus Society held its show on Sunday, July 22.

From September 1 to 9 the Henry Shaw Cactus Society displayed cacti and succulents. The harvest show of the Regional Council of Men's Garden Clubs of Greater St. Louis was held September 15 and 16, and a week later the Rose Society held a fall rose show. On September 26 a women's committee and Stix, Baer & Fuller presented "Fashions Under Glass" in the flower house for the benefit of the Family Life Center at Pevely, Missouri. On September 29 and 30 the 24th Anniversary Exhibition of The Greater St. Louis Dahlia Society was held in the flower house.

The Veiled Prophet queen's bouquet was on view October 3. October 20 and 21 the Allied Florists of St. Louis exhibited 21 tables of various bouquets and flower arrangements.

The annual chrysanthemum show opened with a preview for the Friends of the Garden on November 1 and continued until December 2.

Poinsettias, ardisias and late-blooming chrysanthemums were shown from December 9 to January 13.

MISCELLANEOUS ACTIVITIES

The annual Flower Sermon, a provision of Henry Shaw's will, was given in Christ Church Cathedral on April 29. For this occasion the Garden supplied 225 flowering and foliage plants.

From May 8 to 12 the Women's Association of the Garden conducted their annual sale of plants and garden supplies on the parking lot of Famous-Barr's Clayton store. Plants for the annual-perennial, herb, Climatron, and V.I.P. booths were all grown at the Garden. The women of the association helped in the growing, packing, transporting and selling of the plants.

Palms were loaned to the Chase Hotel October 2 for decorating the Khorassan ballroom for the Veiled Prophet Queen's supper.

Eighty foliage plants were loaned to Famous-Barr for the week of October 8 for the dedication of their new downtown garage at 7th and Olive Streets.

ORCHID DEPARTMENT

R. J. GILLESPIE, ORCHIDOLOGIST

THREE events stand out as being particularly significant in the Orchid Department during 1962.

First: the flowering of a newly collected orchid, *Oncidium sanderae,* proved to be a species which heretofore was believed to be lost. This plant was received from Peru by a collector working for the Garden in a very remote region known as the "Tingo Maria" area. As far as is known the Garden's plant is the only specimen in cultivation.

Second: the arrival of over three hundred plants from Dr. Went's expedition to New Guinea. This is one of the largest and most comprehensive orchid collections ever brought out of

New Guinea to the United States, and as such is a valuable addition from an area where previously the Garden had only a few representative species. Undoubtedly many unusual and interesting types can be expected from this group of plants, including some new species.

The third event of importance was the erection of a revolutionary new "Film-Plastic" greenhouse on the foundation of an older greenhouse. This structure is composed of a series of pipe arches covered with hexagonal chicken wire and polyethylene plastic. Ventilation is achieved by using a 36 inch fan which inflates a perforated plastic sleeve. This system distributes fresh air evenly throughout the house, avoiding hot and cold spots so frequently encountered in the conventional greenhouse structure. In summer, a plastic shade net will replace the polyethylene film, and orchid species which require high light intensity will be grown in this area.

Winterizing Activities: The stove house was once again covered completely with polyethylene film. Despite the work involved, this is the only method by which optimum temperatures can be maintained during the winter in an area where heat-loving plants are kept. The 1961-1962 win-

The new plastic greenhouse with the polyethylene ventilating sleeve inflated.

ter was particularly hard on the orchid collection. Several dozen plants were frozen and many other plants suffered defoliation from exposure to prolonged cold. In order to avoid a recurrence of these conditions in the 1962-1963 winter, it was decided to cover the side walls of each greenhouse externally, from the gutter to the ground, with a layer of polyethylene, and also to attach a layer of Mylar plastic to the gable ends of each greenhouse so as to create a dead-air zone in these areas and thus prevent excessively cold conditions. These measures, all of which are only temporary and involve considerable expense in materials and labor, emphasize in a dramatic way the pressing need for new growing facilities at the Garden.

Orchid Show: The annual Orchid Show was held during the last week of January and during the entire month of February. The show consisted of a series of circular beds containing tropical foliage plants enhanced by hybrid orchids. Several display tables were erected at the back of the exhibit, and these were staged with numerous brightly colored hybrids including Cattleyas, Cymbidiums, and Dendrobiums.

Displays: Displays were maintained throughout the year in the two orchid exhibition areas of the Climatron as well as a display in the botanical orchid house. Flowering orchid plants were also furnished for the Garden Gate event, Friends of the Garden office, and the Shaw House. In keeping with tradition, cut orchids were also donated by the Garden for the Veiled Prophet Queen's bouquet.

Accessions: The valuable collection of New Guinea orchids from Dr. Went's expedition in that area has already been mentioned and it is the most outstanding orchid accession of the year. Numerous other noteworthy accessions were also received; they include collections by the Garden's staff from Ecuador (Dr. Dodson), Panama (Dr. Nickerson), Costa Rica (Dr. Went), Trinidad (Dr. Went), Costa Rica (Dr. Dodson), and Mexico (Dr. Dressler). Orchid plants of importance were also received from Australia, Peru, Guatemala, Montreal Botanical Garden, and the University of California Botanical Garden.

Instruction: Two orchid courses were given by the Garden during the year and these were well attended and enthusiastically received. The Garden staff also co-sponsored a successful all-day course with the Orchid Society of Greater St. Louis. Members of the Garden staff presented orchid lectures at Indianapolis, Nashville, Chicago, Atlanta, Tulsa, and Detroit.

In October, the Garden was host to the annual meeting of the Trustees of the American Orchid Society. This event afforded these men an opportunity to visit the Garden and to observe the Garden's orchid collection first-hand. They were also able to meet with the Garden's orchid staff, thereby acquainting themselves intimately with the purposes and objectives of the orchid work at the Garden.

GROUNDS AND SERVICE

LOUIS G. BRENNER, Grounds Superintendent

GROUNDS

The growing season of 1962 got off to a poor start with drought conditions prevailing during the spring months. Effects of the drought were most noticeable in the lawn areas; spring and early summer growth of bluegrass was curtailed at a season when this grass is normally at the peak of its growth. Slowed in growth by drought and unable to fill out a dense sward, the bluegrass was then vulnerable to many summer lawn weeds, and the lawns were left in general poor condition for summer despite the use of herbicides and fertilizer. In October a vertical-cutter, a specialized machine for renovating lawns by removing the thatch of dry stems and foliage with a vertical cutting action, was added to the lawn equipment. Most of the important lawn areas were renewed using this machine, which eliminates the long hours of raking otherwise necessary.

Development of the marsh in the knoll area has continued with addition of important native iris species, *Iris fulva* (Red iris), *I. brevicaulis* (Lamance Iris), × *I fulva* (Louisiana Iris), from the collection of Mr. Edgar Denison of Kirkwood. *Iris virginica* (Southern Blue Flag) was brought from a planting naturalized at the Arboretum. Royal Ferns *(Osmunda regalis)* were collected in Massachusetts by Dr. Norton Nickerson of the Garden staff for addition to the area. The lower portion of the marsh has been set aside for horticultural marsh plants. Here dwarf New England aster, rosana *(Aster novae-angliae)*, loosestrife, Robert and L. Mordens pink *(Lythrum sp.)* were added to existing Japanese iris and mallows.

As in past years the knolls area bloomed forth the results of many long devoted hours by volunteers of the Men's Garden Clubs of St. Louis under the leadership of Mr. Gil Pennewill. Large plantings of dahlias edged with cushion mums were made and despite summer drought made a fair showing. Lack of adequate water system in the knoll area makes it impractical to attempt mass floral display with plants other than the most rugged perennials.

The Rose Garden, always a great attraction from late May to killing frost, had an especially fine season and made an outstanding display in early June. As in past years the new varieties obtained from major rose growers of the country were received with great interest by visitors who seemingly find annual fascination in viewing the new varieties blooming here a full season before becoming available on the market. Pranksters caused more than usual annoyance by shuffling the plant labels in the Rose Garden. Resetting the labels became a weekly chore added to an otherwise full schedule of the grounds department.

Home gardeners and breeders will find new interest in the notable expansion of the day-lily collection. Through the efforts of Mr. and Mrs. George Pettus and Mr. and Mrs. L. E. Stone, hemerocallis enthusiasts, 92 named varieties of day-lilies were added to an already extensive inventory. Plants were donated to the Garden by members of the St. Louis Hemerocallis Society and other day-lily fanciers. All of the new varieties were planted in the knoll area and may be moved later to an area in which they can be given more systematic treatment. Extensive plantings of day-lilies, representing collections assembled by Mr. Paul Kohl, Floriculturist, can also be seen in the Linnean Garden from early summer to midsummer.

In early November two vacuum machines for picking up and loading leaves were added to the grounds equipment. The smaller machine has been effectively used in cleaning leaves from the base of shrubs and from ivy and myrtle beds. It is also easily converted into a blower unit for drifting leaves on large lawn areas into piles convenient for loading with the large vacuum machine. Use of the blower unit has eliminated many hours of raking otherwise necessary. The large vacuum loader is mounted on a tractor-drawn trailer with a van-like bed to catch and haul the fragmented leaves as they are picked up by the loader. Both machines fragment dry leaves to a condition good for mulching and even better for compost material. Such fragmentation also enables crews to operate machines for a considerable time before unloading the hopper.

The efficiency of this equipment is somewhat dramatic. Cleaning up leaves that drift against the fences bounding the Garden formerly required a crew of 3 men for more than a week, a job so expensive that it was undertaken not more than twice during the winter. With the new vacuum equipment the same task is accomplished by 2 men in a little more than one day.

SERVICE

In addition to the multitude of tasks required in maintenance of buildings, the maintenance crew also built the Indonesian snack bar, popularly known as the Rumahsahtay, constructed the Arctic chamber for growing Arctic plants and carrying out temperature research, and reconditioned the roof of the aroid greenhouse. Work on such projects was done almost entirely by Garden workmen making use of the skilled hands of Jess Mayhan, painter-glazer, and Elzie Moss, carpenter. Additional labor was drawn from the grounds crew as required.

ENGINEERING OPERATIONS

KENNETH A. SMITH, ENGINEER

THE usual routine maintenance and operation of heating plant equipment as well as that of mechanical equipment and control systems in other locations has been carried on. As new mechanical installations are put into operation, a larger volume of our work falls into this category each year.

Changes of existing equipment and new installations require closer attention as time goes on. In 1962 some of the major work items on the Climatron included the installation of lights and wiring for the Climatron lily pool, relocation of the concert tape machines and jungle sound recorders, and changing of the entrance arrangements. New counters were built, and circulating fans were installed to keep the entrance area free of condensation and frost.

The Engineering Department installed wiring and plumbing for Rumahsahtay, the Garden's Indonesian snack bar.

Work continued in the Floral Display House, where an electric line and panel were installed to supply experimental growing boxes. Some electrical work was done on the boxes. Lights, mechanical equipment and wiring were put in for the experimental cold room at the Experimental Greenhouse, and new room coolers with the necessary wiring were installed in the Administration Building and Tower Grove House basement.

More artificial trees used for growing orchids were made, using pipes welded together.

Other duties of the Engineering Department included maintenance of grounds equipment and small jobs for other departments.

ARBORETUM

FRANK L. STEINBERG, Superintendent

The Arboretum at Gray Summit is open to the public every day and cars are permitted to drive around the Pinetum Lake throughout the year. The longer drive past the dogwoods, redbuds, and naturalized daffodils to the trailhouse and wildflower trails was kept open in April and May, then was opened again for the highly successful Friends of the Garden picnic which was held September 23.

The biggest job in maintaining the Arboretum is mowing, which in 1962 required 631 tractor hours. This figure is 159 hours less than in 1961 and the difference reflects the greater efficiency of the new tractor and mower purchased in June. Mowing begins in June and, weather permitting, is finished by the first of November. The Pinetum was mowed three times in 1962, one more time than in 1961.

The two tool sheds were cleaned and given two coats of paint, and guard rails of all the bridges were also painted. Work at the Main Gate included cleaning and painting of the gates, iron work, and vases.

Seventy-two dead pines were removed from the Pinetum, and pruning and brush cutting continued as time permitted.

Road grading was done as necessary and the reservoir for the greenhouse reservoir was filled in August and again in November.

SPRING COURSES

JUST as a reminder, here are some notes and dates on courses previously announced:

HOW TO PROPAGATE FROM SEED

Fundamental facts and procedures for producing annuals, biennials and some perennials from seed for use in your garden. The Garden supplies seed, germinating media and soil for four metal flats of seedlings which may be taken home. Persons wishing to supply their own seed must bring it to the first session.

5 Sessions — Fee $12.00	**Experimental Greenhouse**
Tuesday afternoons — 1 to 2:30 P. M.	**March 12, 19, April 2, 9, 16**
Thursday evenings — 8 to 9:30 P. M.	**March 14, 21, April 4, 11, 18**

Instructors: Mr. Clarence Barbre
Mr. Kenneth Peck

PREPARATION AND CARE OF LAWNS

Instruction on kinds of grasses and weeds and how to identify and control them. Preparation of ground for lawn establishment, soil conditioning, fertilizers and their application, rebuilding old lawns, maintenance and equipment will be discussed. Special attention will be given to individual problems.

3 Sessions — Fee $6.00		**Museum Building**
Section #1	**Thursday evenings — 7 to 9 P. M.**	**March 28, April 11, 18**
Section #2	**Tuesday evenings — 7 to 9 P. M.**	**April 9, 16, 23**

Instructor: Mr. Raymond Freeborg

HOME ORCHID CULTURE

Orchids suitable for home culture and best ways of growing them. Potting demonstrations and practice. Students may take home the plant they pot.

1 Session — Fee $10.00	**Orchid Greenhouse**
Saturday — 10 A. M. to 3 P. M.	**April 6**

Instructor: Mr. Robert J. Gillespie

FIRST MONDAY LECTURE

Miss Edith S. Mason, Landscape Architect, will present an illustrated lecture on "IDEAS FOR ST. LOUIS GARDENS" at 8 P. M., Monday, April 1, in the Museum Building of Shaw's Garden, Tower Grove and Cleveland Avenues. The lecture is open to the public without charge.

FRIENDS OF THE GARDEN ACTIVITIES

HARRY WUERTENBAECHER, JR.

THIS past year has been a successful one for the Friends of the Garden. We appreciate tremendously the memberships that have been maintained and those that have been added during the year. The income from these memberships is extremely important to the operation of the Garden.

In addition to knowing that you Friends have been instrumental in helping to maintain the Missouri Botanical Garden as one of the most outstanding gardens in the world, we hope you have enjoyed your membership during the past year. Many of you attended the Indonesian Dinners last spring in the Floral Display House and, I am sure, had a delightful time.

The superb turn-out for the Friends picnic at the Arboretum in September exceeded any of our wildest expectations, thanks to Mrs. Curtis Ford. We hope to continue similar Friends picnics at the Arboretum in the future.

As many of you know, a group of dedicated Friends planned an intensive telephone campaign for new memberships that was to take place during January and February. Just prior to the launching of this campaign the Greater St. Louis Arts Council fund raising campaign was announced and we decided that it would not be advisable for us to conduct our own campaign prior to the launching of this all-out cultural drive. We are indebted to the individuals who planned this campaign, Mrs. M. M. Jenks and Mrs. C. C. Johnson Spink, and to those who had volunteered to work on it. When the new cultural campaign is completed for 1963 we will have a membership drive of our own and we hope we can count on the same enthusiastic support that was shown for our proposed drive earlier.

As always, we urge everyone to retain his own membership in the Friends and to obtain new memberships whenever possible. A contribution to the Friends is an excellent way to handle a memorial tribute, a get-well wish, or a gift of any kind.

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ALPHABETICAL LIST OF ALL MEMBERS OF THE FRIENDS OF THE GARDEN

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SPRING GARDEN TOUR

THE Garden Club of St. Louis is sponsoring showings of seven beautiful private gardens this spring for the benefit of the Missouri Botanical Garden. May 3rd through 5th are the dates to remember for these tours.

This year for the first time, the houses of Garden Club members as well as the gardens will be open for visitors. Architecture and garden design range from the classic to contemporary and include a variety of period styles, Colonial Williamsburg and English Tudor to Early Missouri.

Special displays of gardening equipment will be shown in the gardens, many of which are the work of the best landscape artists in the Midwest. Gardening experts from the Missouri Botanical Garden will be on hand to answer garden questions for visitors, and in addition to the garden exhibits, the homes will offer fine collections of antiques and paintings.

The homes and gardens on this year's tour are those of Mr. and Mrs. I. A. Stevens, #2 High Downs, Ladue; Mrs. Joseph L. Werner, 9625 Ladue road, Ladue; Mr. and Mrs. Robert Brookings Smith, 3 Glenview road, Ladue; Mr and Mrs. Henry Hitchcock, Woods Mill road, Chesterfield; Mr. and Mrs. Albert G. Blanke, 10 Hortense place, Mr. and Mrs. Meredith C. Jones, 6419 Ellenwood avenue, and Mrs. Theron E. Catlin, 34 West Brentmoor Park.

Information and advance tickets ($3.50 each) are available from Mrs. Warren McK. Shapleigh, Box 1606, R. R. 13, Kirkwood, Mo., and tickets will also be available at the gardens on the days of the tour. Here is an opportunity to see outstanding examples of garden and home design while contributing materially to the Missouri Botanical Garden's activities.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 9:00 P. M. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

April 1963
Volume LI
Number 4

COVER: Edgar Anderson, Curator of Useful Plants at the Garden, with a Boxwood *(Buxus sempervirens)* at the Arboretum. The tree was brought from Yugoslavia 25 years ago and has been successfully grown here ever since.

PHOTO BY BRIAN GORDON

CONTENTS

Thirty-One Broad-Leaved Evergreens for the Central Midwest

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: BRIAN GORDON.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden
Vol. LI No. 4 Bulletin April 1963

THIRTY-ONE BROAD-LEAVED EVERGREENS FOR THE CENTRAL MIDWEST[1]

FREDERICK G. MEYER AND EDGAR DENISON

Second edition prepared by EDGAR ANDERSON, CLARENCE BARBRE, and EDGAR DENISON

TODAY, more and more evergreens are being grown for their year-round appeal. In the Midwest, where few evergreens are indigenous, this trend is all the more understandable. There is an increasing demand for dwarf shrubs and small trees that will fit into the scheme of small modern gardens and harmonize with today's small homes and low ranch-houses. The broad-leaved evergreen trees, shrubs and ground-covers are well adapted to these needs. Their use can also greatly improve old gardens as replacements for overgrown deciduous shrubs, which are not only difficult to maintain but frequently are out of proportion to the many architectural embellishments of older houses.

Woody evergreen plants fall into two groups: the conifers, cone-bearing plants with needle-like leaves (pines, spruces, junipers), and the broad-leaved evergreens, an extremely diverse group of woody flowering plants, related in most instances only by having leaves that remain green throughout the year—American Holly, Mahonia, and Boxwood, for example. For convenience, the broad-leaved evergreens will be referred to subsequently as "broadleafs."

For their esthetic appeal, the broadleafs are unexcelled among ornamental plants. Some kinds, such as Holly, Mahonia, and Pyracantha, produce colorful berries; the Southern Magnolia, Pieris, and Mountain Laurel are noted for their attractive flowers. Leaves of the various kinds differ widely in size, shape, and color. The broadleafs are tidy of habit, dropping few leaves at any one time, and they never become overgrown and weedy as do many hardy deciduous shrubs. In addition they remain relatively free from insect attack and disease.

According to a leading St. Louis nurseryman, evergreens were little grown in our area thirty years ago. Now perhaps a hundred kinds, most of which are obtainable from local nurseries, may be grown here; and of these, thirty to forty are broadleafs. All broad-leaved evergreens are truly aristocrats and require careful attention to their needs if the owner wishes to see them in his garden as truly attractive plants. If this consideration and observant care for their well-being are not feasible it would be better to use Pfitzer Juniper and other needle evergreen plants.

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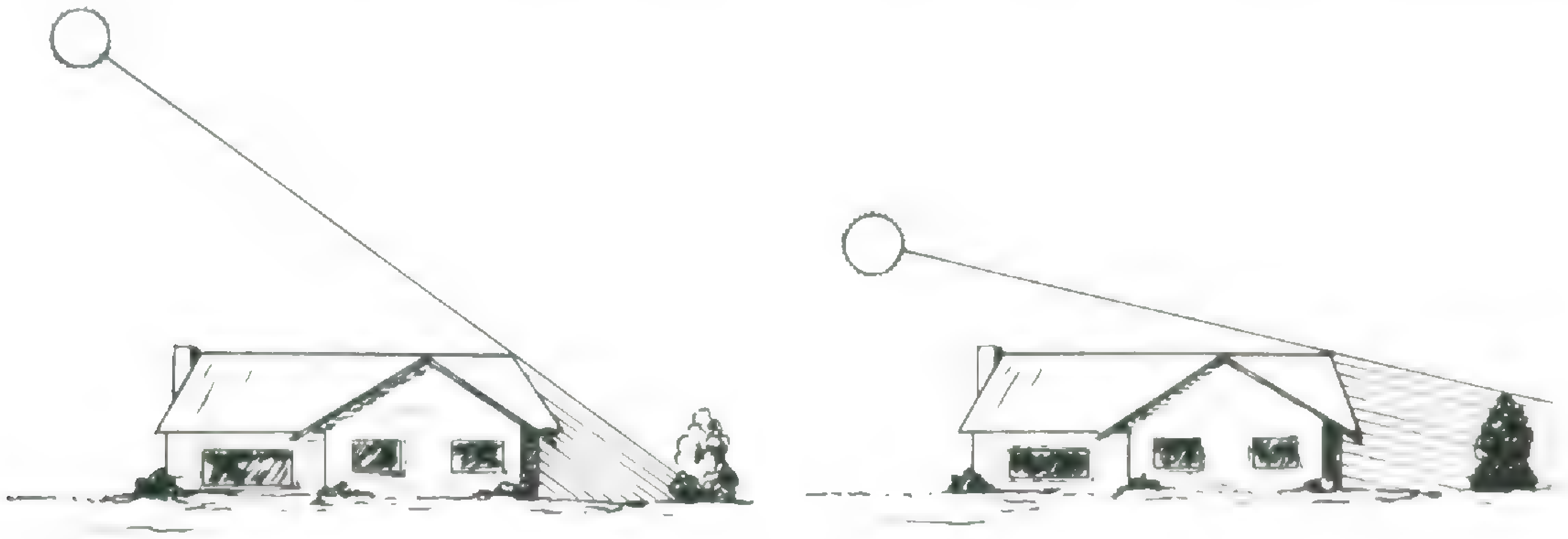
[1] An extensive treatment of the broad-leaved evergreens for the entire country is found in the Brooklyn Botanic Garden Handbook No. 22, *Broad-leaved Evergreens*, which can be purchased for $1.00 from the Brooklyn Botanic Garden.

CLIMATE IN THE CENTRAL MIDWEST

The central Midwest as defined for this paper includes an area extending fifty miles north, one hundred fifty miles east, and one hundred miles south of St. Louis and west to Kansas City.

General: Sudden change characterizes the climate of mid-continental United States. Wide fluctuations in temperature, long drought periods, drying winds, and bright sun may occur at any season of the year. These climatic factors which account for the weather patterns in the Midwest are all too well-known to residents within our area. Maximum temperatures in summer, minimum winter temperatures, precipitation and atmospheric humidity are not limiting factors in themselves in growing broadleafed evergreens in our area. It is the timing of the climatic factors—temperature, precipitation, wind, solar radiation—which matter to the plant and to the plantsman. Relatively high temperatures one day followed by freezing temperatures the next, accompanied by bright sunny weather and freezing winds, are the chief limiting factors in growing broadleafs in the central Midwest. Particularly difficult for the gardener without experience in the Middle West is the way the winter climate may vary not only from year to year but from decade to decade. Some of the most attractive hollies are not to be generally recommended because they cannot withstand the low temperatures we may get in St. Louis once every twenty or thirty years.

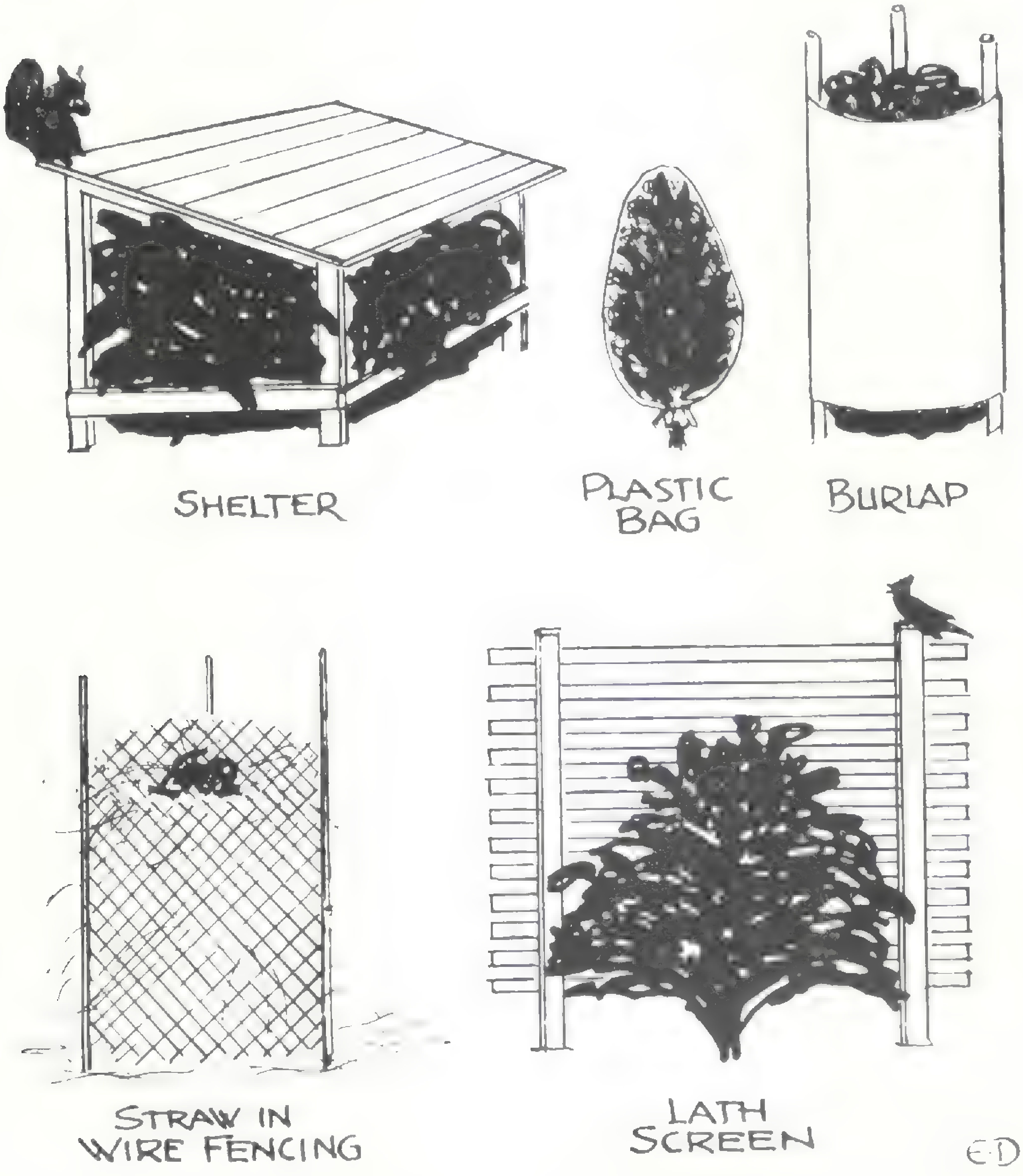


Broadleafs not sun-resistant can be placed on north side of house for half shade during summer and full shade in winter when sun is low. From Brooklyn Botanic Garden.

Winter: Our winters normally are characterized by long intervals of bright sun, especially during January and February, with periods of drying-freezing winds while there is little snow protection. Sudden temperature changes, sometimes with a 30–40° differential from one day to the next during the period from November to April, are common. Alternate freezing and thawing, especially towards the end of February or March just as the plants begin to grow, inflict considerable damage some years. Likewise, an early freeze in November often does more damage to broadleafs than 20°

below zero in January. In fact, many plants may be relatively unharmed by continuous freezing yet will succumb to sudden temperature changes. It is largely due to alternate freezing and thawing that camellias and some other kinds of broadleafs may not be successfully grown in our area. Sun-scald may inflict much damage by causing the leaves to turn brown and the plants to defoliate. Broadleafs which are exposed to sun while the ground is frozen or when the humidity remains relatively low—frequently around 20 per cent in January and February—will sun-scald if the water intake from the soil is insufficient to offset transpiration. This condition is accelerated by dry north and west winds. Most broadleafs considered to be hardy here will not tolerate full sun but require protection of some sort. One should know whether the kinds in question tolerate full sun, or require partial or full shade.

Providing the correct microclimate should be the initial consideration before attempting to plant broadleafs.



Various methods for protecting young broad-leaved evergreens from winter sunscald. Upper left drawing after Brooklyn Botanic Garden.

Most kinds grown here require protection of hedges, trees, buildings, walls and shelter sheds, especially in winter. The shade of a tree would provide the correct microclimate for growing ivy, or the shady north side of a building would provide the required microclimate for Leucothoë, Pachysandra, and other kinds requiring full shade.

Well-established plants may be expected to withstand the rigors of our climate more satisfactorily than young or newly planted ones. Aids for preventing winter damage to young plants, especially if it is difficult to provide natural protection, include: (1) the use of polyethylene bags, provided with airholes, to completely envelope the young plants, (2) plastic wax sprayed on the foliage in late autumn to prevent excessive water loss during freezing weather (obtainable from nurserymen under several commercial names). For other protection methods see illustration.

Summer: The greatest damage to broadleafs in summer occurs during periods of drought with temperatures above 90° F. and with a relative humidity of less than 30 percent, often accompanied by hot desiccating winds from the Great Plains. However, these conditions are easier to control and cause less damage to broadleafs than wintertime conditions.

We have learned through experience which plants grown in our latitude respond favorably or unfavorably to the prevailing climatic patterns. The common Boxwood *(Buxus sempervirens)*, *Magnolia grandiflora*, Nandina and some of the hollies probably would not thrive more than 100 miles north of St. Louis even with maximum protection. On the other hand, 60 miles south of St. Louis, these same plants grow with almost complete abandon.

Most of the broadleafs are immigrants to our gardens from China, Japan or parts of Europe, although several kinds are indigenous to the southeastern United States. The American Holly occurs in southeastern Missouri and is the only indigenous broadleaf shrub of the state. For this reason it thrives in most parts of the central Midwest in full sun.

CULTURAL METHODS

Soil: Soil conditions for growing broadleafs in our area range from bad to excellent. In some areas with poorly drained clay soil, considerable improvement in tilth would be essential. Most kinds require a well-drained soil with a relatively high (40–50 percent) organic component for most vigorous growth. Leaf mold and peat moss are easily obtained sources of organic material. Broadleafs especially like nitrogen, since these plants are grown principally for their leaves. The yellowing of hollies and other broadleafs may be overcome by adding to the soil additional quantities of organic matter and a relatively high nitrogen fertilizer. Use any commercial fertilizer with N–P–K ratio around 6–10–4 or 8–8–8 at a rate of ¾ of a pound or ¾ of a pint per 100 square feet of bed. This may be repeated twice at monthly intervals but none should be added after July 1 since it is necessary to let the plant stop growing to protect it against freezes. If the leaf veins are green and interveinal space is light yellow, a deficiency of iron in the soil is indicated. To remedy, add 3 teaspoonsful of Sequestrene in a gallon of water to each plant. Repeat weekly until normal green color results. It may be more convenient, though probably more expensive, to use a general spray fertilizer like Miracid, which contains both the nitrogen and the necessary iron. In using these sprays, spray directly on the foliage and let it drop down onto the soil. It will go in both through the leaf and the root.

Broadleaf shrubs may be planted near deep-rooted hardwoods such as oaks, hard maples, hickories, and sweet gums; they should not be planted near soft-maples, elms, sycamores, poplars, willows, or other trees with masses of surface roots which will compete for water. A few of the ground-covers, especially ivy and Vinca, may be planted under soft-maples or elms with complete success.

Planting Broadleafs: Set the plant at the same level it was in the nursery on firm but well-drained soil. First excavate to two feet deep and three times the width of the plant (discard all heavy clay). To refill the hole, mix equal parts of sand, brown peat and good garden soil. After planting, cover over with mulch. Add ¼ cup of 6–10–6 or 8–8–8 fertilizer and ¼ cup of ferrous sulphate for 100 square feet of bed area.

Mulching: Broadleafs usually require more water than deciduous shrubs. Mulches act as insulators. They help to maintain lower soil temperatures in summer, prevent deep freezing of the soil in winter, and greatly reduce evaporation of water from the soil surface. An organic mulch, 3–4 inches deep, of sawdust, wood chips, buckwheat hulls or leafmold may be used. All of these recommended materials, with the exception of leafmold, are low in cellulose and will require 2 pounds of ammonium sulfate to each bushel of mulch to prevent nitrogen starvation of the plant during decay of the mulch.

Propagation: The accelerated interest in broad-leaved evergreens may be attributed, partly at least, to several recent advances in propagating techniques. The use of mist propagation and improved methods of grafting have been largely responsible for the increased popularity in growing the named forms of American Holly. Other broadleafs, formerly uncommon and difficult to propagate, now have become common. Propagation under polyethylene plastic tents has also become a highly successful method.

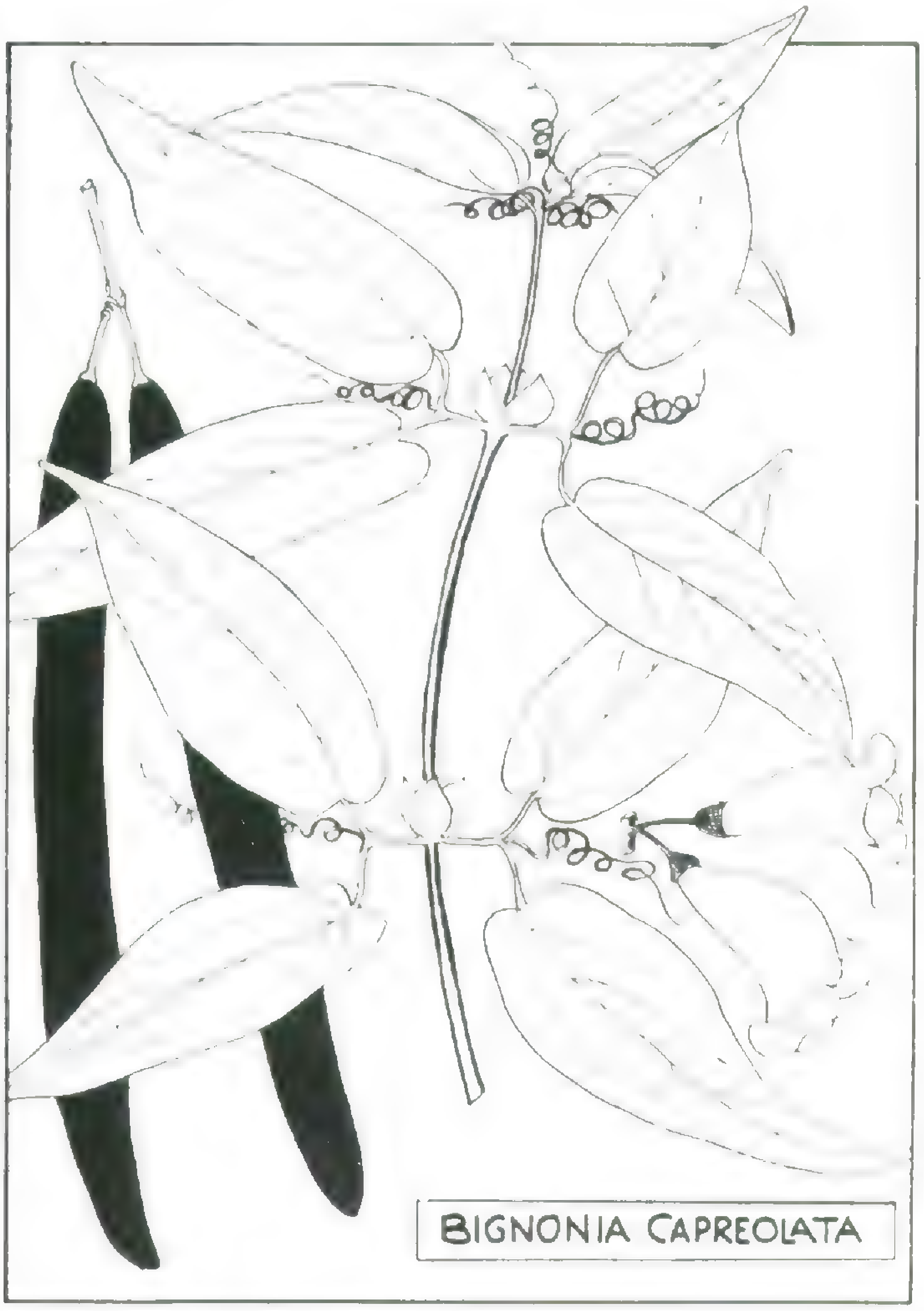
Maintenance and Disease: Home gardeners today favor kinds of ornamental shrubs which require less maintenance than do most deciduous shrubs such as privet, forsythia, and mock-orange. The broadleafs possess all their virtues and few of their undesirable traits. Some of the hollies develop into more shapely plants when given a yearly pruning, cutting back four to five inches of tip growth; but hardly ever is it necessary to keep broadleafs within bounds in the same way as for most deciduous shrubs.

The broadleafs in general are remarkably free from insect pests and fungus attacks. The American Holly, Japanese Pieris, Vinca, and Ivy are the only broadleafs grown in our area known to be occasionally attacked by insects or fungus infections.

GROUND-COVERS

1. *Bignonia capreolata* (Trumpet Vine Family). 5–6 inches. **Cross Vine.** Introduced to Gardens, 1864. Southeastern United States.

A climbing evergeen with orange-red trumpet flowers 1–2″ long and lustrous paired leaves that are oriented on the stem in the form of a cross. (There is also a cross in the wood when the stem is cut.) It is completely hardy in either sun or shade, although the leaves may turn bronze-green in winter. Vigorous plants may grow a foot a year, yet they maintain a neat attractive habit without becoming excessively rampant. It grows in well-drained neutral soil and is useful on steep slopes as well as on trellises and trees. A little known plant in cultivation. Slow to flower in the North.



BIGNONIA CAPREOLATA

2. *Euonymus fortunei* (Spindle-Tree Family). 12 inches. **Purple-Leaf Winter-Creeper.** Introduced to Gardens, ca. 1865. China.

This common evergreen ground-cover grows vigorously in a wide variety of soil types in either sun or shade. It will thrive even with neglect, although after several years a mass planting takes on a disheveled appearance due to the scraggly growth habit. In winter sunlight the leaves turn bronze-green. Good for sunny banks. Scale insects attack this plant but they can be controlled with Malathion.

3. *Hedera helix* (Ginseng Family). 4–5 inches. **Common Ivy.** Cultivated since ancient times. Europe.

The common Ivy ranks first among the useful, reliable, and rapid-growing broadleaf ground-covers for our area. Its habit of climbing over walls and on trees gives it a special place in our gardens. Cuttings 4–6 inches long, taken in May and inserted directly into the soil for half their length and a foot apart, will root rapidly and develop considerable growth the first season. Keep constantly damp until roots are established.

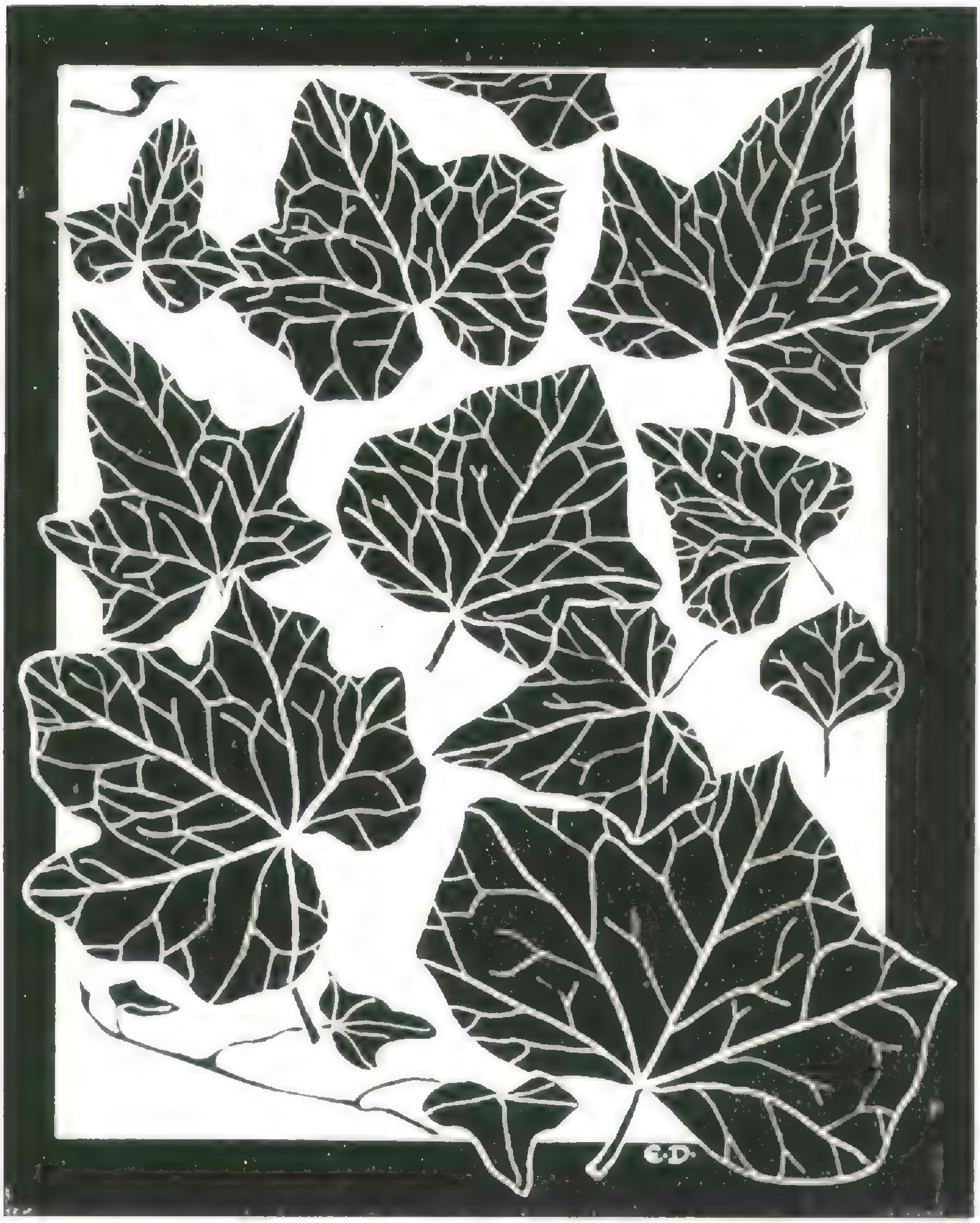
Varieties.—'MBG Bulgaria.'—Leaves 4–5 inches wide, shallow lobed, not prominently veined. A vigorous grower that is drought hardy and resists winter injury; it thrives best in full shade but will grow in partial to full sun. Introduced by the Missouri Botanical Garden in 1936.

'Baltic.'—Leaves 3–4 inches wide, deeply lobed, prominently veined. Growth less vigorous than 'MBG Bulgaria.'

(The various strains of English Ivy, although widely used, are not completely hardy in severe winters and are not recommended for permanent plantings in our area.)

4. *Pachysandra terminalis* (Boxwood Family). 6–8 inches. **Japanese Spurge.** Introduced to Gardens, 1882. Japan.

Bulgarian Ivy at Missouri Botanical Garden



Variability in leaf shape of the Common Ivy

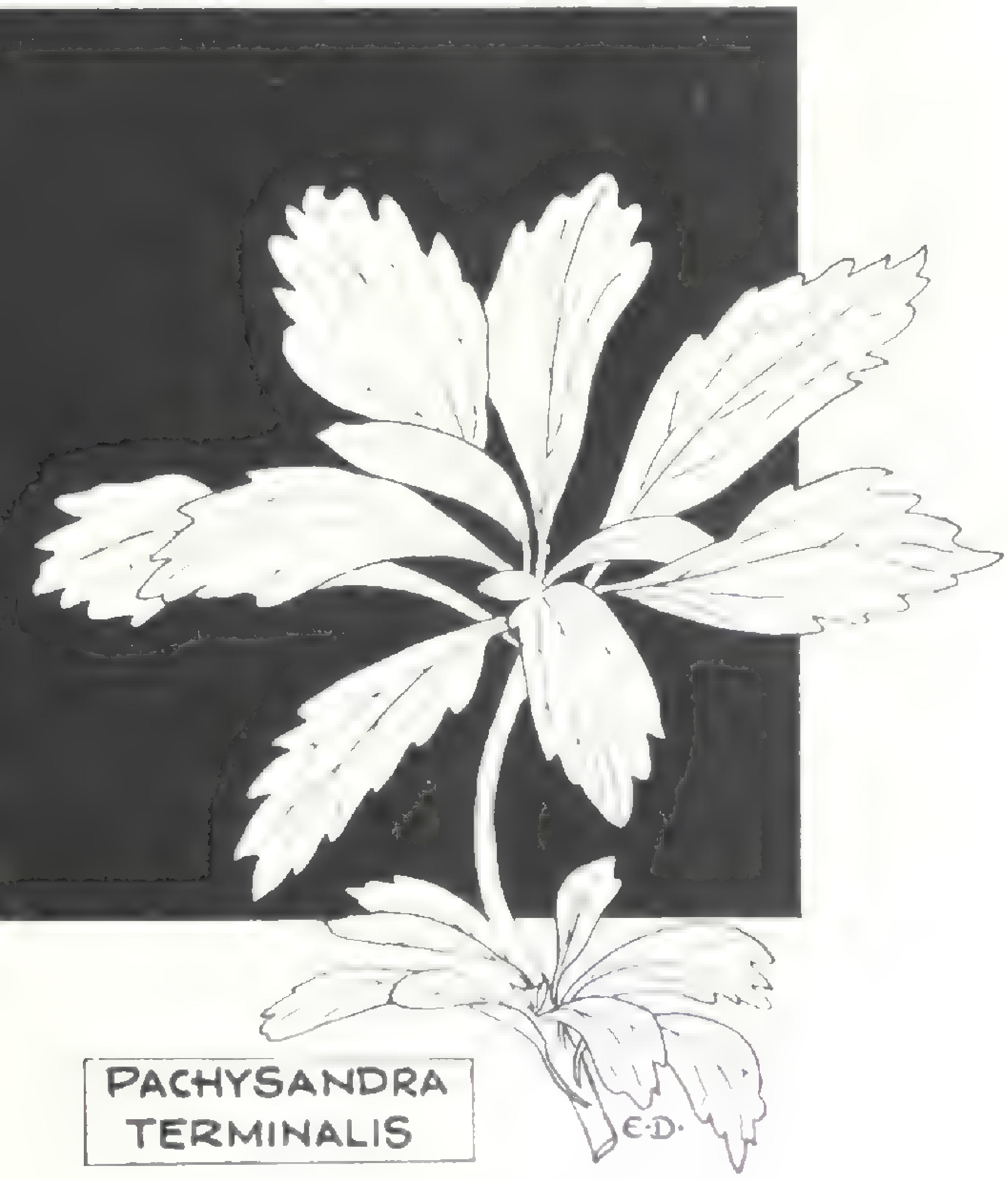
A highly esteemed low-growing carpeting plant with light green serrated leaves disposed in whorls near the tips of greenish succulent stems. Small yellow-green flowers aggregated in small heads appear in the spring. A long-lived plant that spreads by rhizomes and grows more slowly than ivy or periwinkle. It should be grown in full or partial shade and in perfectly drained acid soil with a 50 percent humus content.

5. *Vinca minor* (Oleander Family). 4–5 inches. **Myrtle, Periwinkle.** Cultivated since ancient times. Europe.

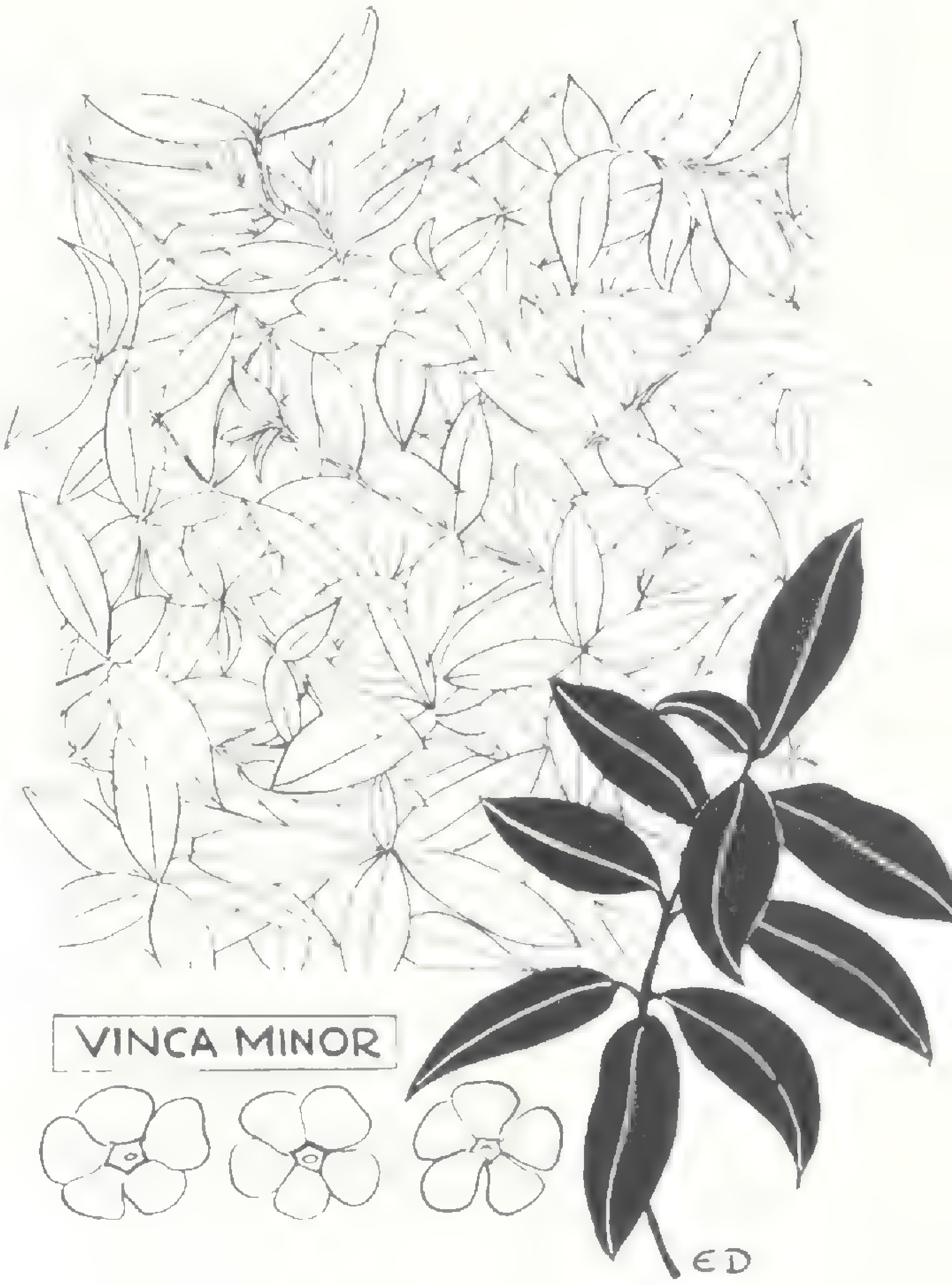
A very reliable old-favorite groundcover which will grow under a wide variety of conditions. The dark green glossy leaves about an inch long are borne on weak reclining stems which quickly take root in contact with the soil, spreading the plant in all directions. In April or May the erect new growth and small blue-violet flowers about one-half inch in diameter contribute a vernal freshness not associated with some other broadleaf ground-covers. Iron-clad for hardiness throughout our area, the Myrtle does best in full shade in well-drained neutral soil with a relatively high organic content. The leaves often burn rather severely in full sun during hot, dry summers.

Varieties.—'Bowles' produces blue flowers larger than those of the common type. White-flowered and purple-flowers forms sometimes are grown.

6. *Berberis* × *chenaultii* (Barberry Family). 3–4 feet. **Chenault Barberry.** Known in cultivation, 1928. Garden hybrid.


PACHYSANDRA TERMINALIS

A highly ornamental hybrid barberry *(B. gagnepainii* × *B. varruculosa)* of a semi-dwarf spreading habit with narrow leaves. It does not object to full sun in summer, but needs partial shade in winter to prevent sunscald.


VINCA MINOR

7. *Berberis julianae* (Barberry Family). 6–8 feet. **Juliana Barberry.** Introduced to Gardens, 1900. China.

Highly prized for the leathery, shiny, spine-tipped leaves and the attractive, gently arching lateral branches. Clusters of chartreuse flowers about one-quarter of an inch in diameter appear among the leaves during April, followed by bluish berries in late summer. Growth is rapid—plants 15–18 inches high will produce a three-foot hedge in three years. Well established hedges may require heavy and repeated pruning. It is almost fully hardy, although some of the leaves turn red at the approach of cold weather and may become tarnished after the first hard freeze. Some freezing back after below-zero winters. Drought-resistant

Berberis julianae

once established, it develops best in full sun; shade-grown plants become leggy. An excellent hedge or screening plant.

Varieties.—'Nana,' a dwarf form. 'Pyramidalis,' an upright form with ascending branches.

8. *Berberis sargentiana* (Barberry Family). 4–5 feet. **Sargent's Barberry.** Introduced to Gardens, 1904. China.

Similar to the Juliana Barberry but with narrower leaves. At the Missouri Botanical Garden, specimens of the Sargent's Barberry are as hardy as the Juliana Barberry, though less attractive. It may be grown like the latter species.

9. *Berberis tricanthophora* (Barberry Family). 4–5 feet. **Three-Spined Barberry.** Introduced to Gardens, 1907. China.

A densely branched dwarf shrub having spiny leaves with waxy bloom beneath and lustrous green above. Hardy here but rarely grown. A handsome plant requiring full sun to half shade in mid-summer with somewhat more shade in winter. Does best in a well-drained, slightly acid soil.

10. *Buxus microphylla* var. *koreana* (Boxwood Family). 4–5 feet. **Korean Boxwood.** Introduced to Gardens, 1919. Korea.

Reputed to be the hardiest boxwood for our area. Temperatures of 20° below zero within the past twenty-five years have not seriously injured the specimens at the Missouri Botanical Garden Arboretum. Vigorous young individuals will grow about 3 inches a year. Plants 20 years old should stand 5 feet high. Forms a dense, much-branched globose or pyramidal shrub,

Buxus microphylla var. *koreana*

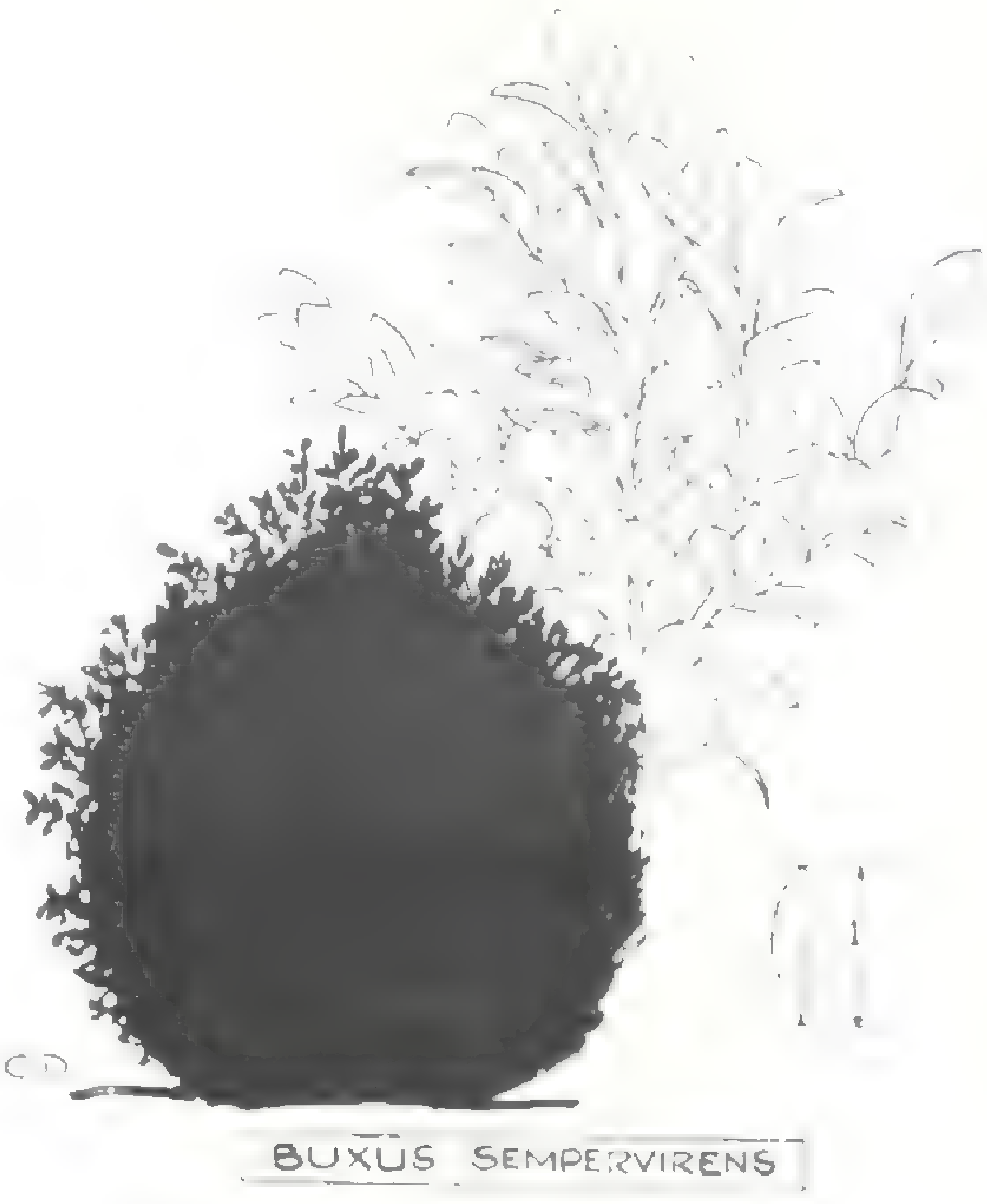
hardly distinguishable from the common Boxwood *(Buxus sempervirens)*. However, unlike the common Boxwood, the leaves of the Korean species are dull and become a bronzy brown-green, especially in the winter sun. Shade-grown plants remain greener. May be grown in full sun without protection. Prefers a well-drained soil with a 50 percent organic content, pH 6.0–8.0.

Variety—*sinica,* from China. Of more upright growth habit, the leaves are larger and more bronze in winter than var. *koreana.*

11. *Buxus sempervirens* (Boxwood Family). 10–12 feet. **Common Boxwood.** Known in gardens since ancient times. Europe.

Highly esteemed for the small, fragrant glossy leaves and the dense globose growth habit. Pyramidal and columnar types are also grown. Despite the slow growth—about two to three inches per year—few plants we grow can offer more in reward for the patience required to produce a mature boxwood specimen. The common boxwood is less hardy in youth than older well-established plants and should be protected from sun and freezing winds in winter. Plant in well-drained soil; boxwood loathes wet feet, especially in winter. An occasional sprinkling of agricultural lime once a year is recommended to maintain a slightly alkaline soil.

Varieties.—Some of the hardiest forms come from Washington, Missouri, where boxwood has been grown for 100 years. A form more recently introduced by the Missouri Botanical Gardens from Yugoslavia has been successfully grown in the St. Louis area over the past twenty-five years. Other kinds of unknown origin are grown here.

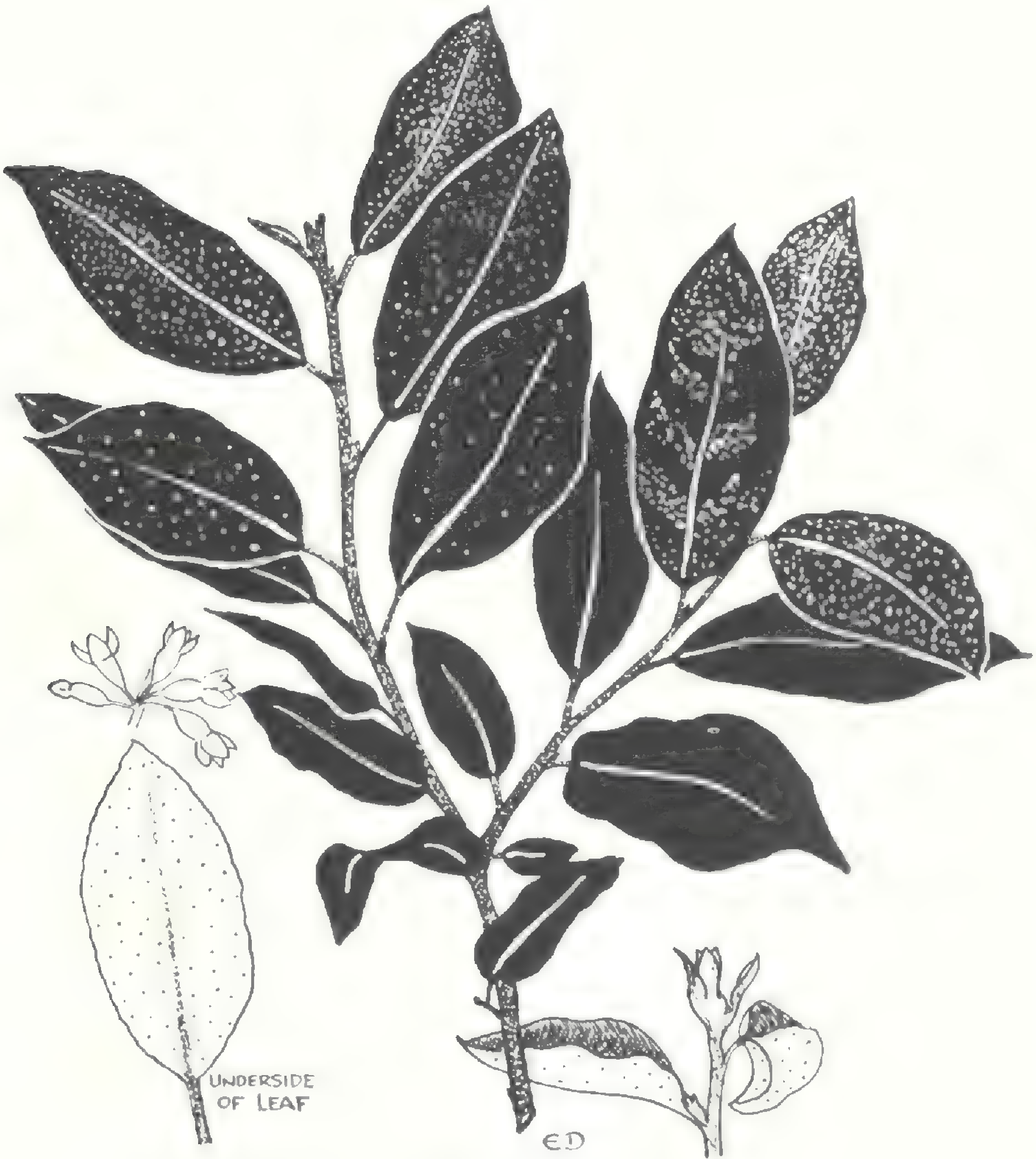


12. *Eleagnus pungens* (Russian Olive Family). 10–15 feet. **Evergreen Elaeagnus.** Introduced to Gardens, 1830. Japan.

A much-prized, densely branched round-headed shrub known for its attractive silvery evergreen leaves 1–2 inches long and the fragrant white flowers borne from September to December. Golden-brown stellate hairs are dispersed like small polka-dots over the silvery ovate leaves and branches. Well-established plants are fully hardy if given the protection of surrounding trees from freezing winds and winter sun. Does not object to full sun in summer. Young plants given additional protection will grow 8–10″ a year. Prefers a well-drained neutral soil. This is a good hedge plant.

Buxus sempervirens

Varieties.—Fruitlandii; Reflexa; Si-



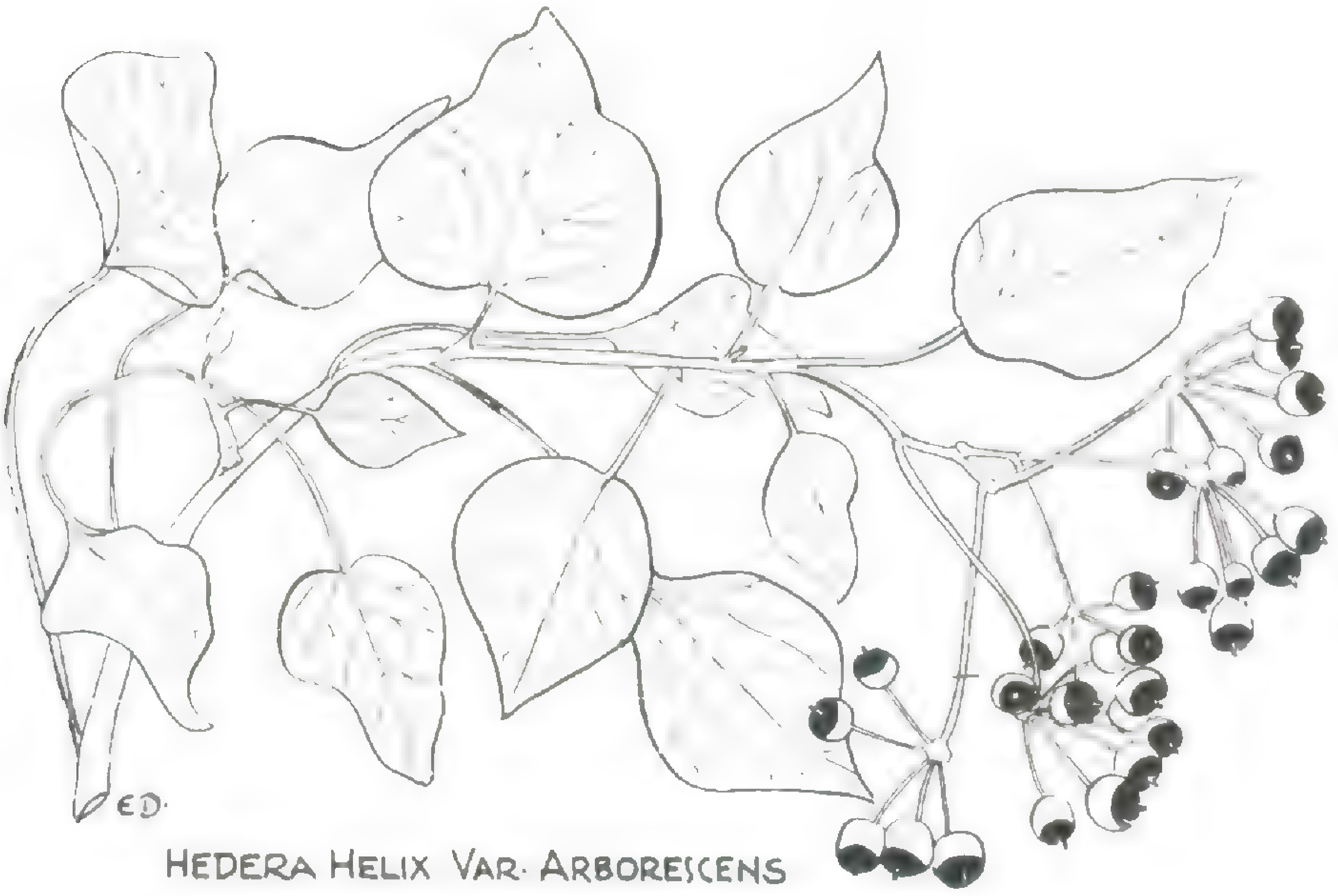
ELAEAGNUS PUNGENS

monii. These forms differ in the size and shape of the leaves and in the habit of growth.

13. *Hedera helix* 'Arborescens' (Ginseng Family). 6–8 feet. **Shrub Ivy.**

Ivy may produce two kinds of leaves, juvenile and adult, on the same vine. As a creeping ground-cover, the plants produce only juvenile type leaves year after year, seldom branch, and never flower. Yet as the juvenile vine becomes older it will climb on a wall or a tree if given a chance, and will produce woody branches with mature leaves and eventually flowers. Changes from juvenility to adulthood are evidenced by a transition from lobed to almost unlobed leaves, and by the development of woody flowering branches.

Shrub Ivy plants are produced by cuttings taken directly from the mature branches. A rooted scion eventually develops into an erect ivy bush, though without careful pruning it may revert to a semi-juvenile vine-like growth. Cuttings from the mature branches are much more difficult to make than from the juvenile growth.



HEDERA HELIX VAR. ARBORESCENS

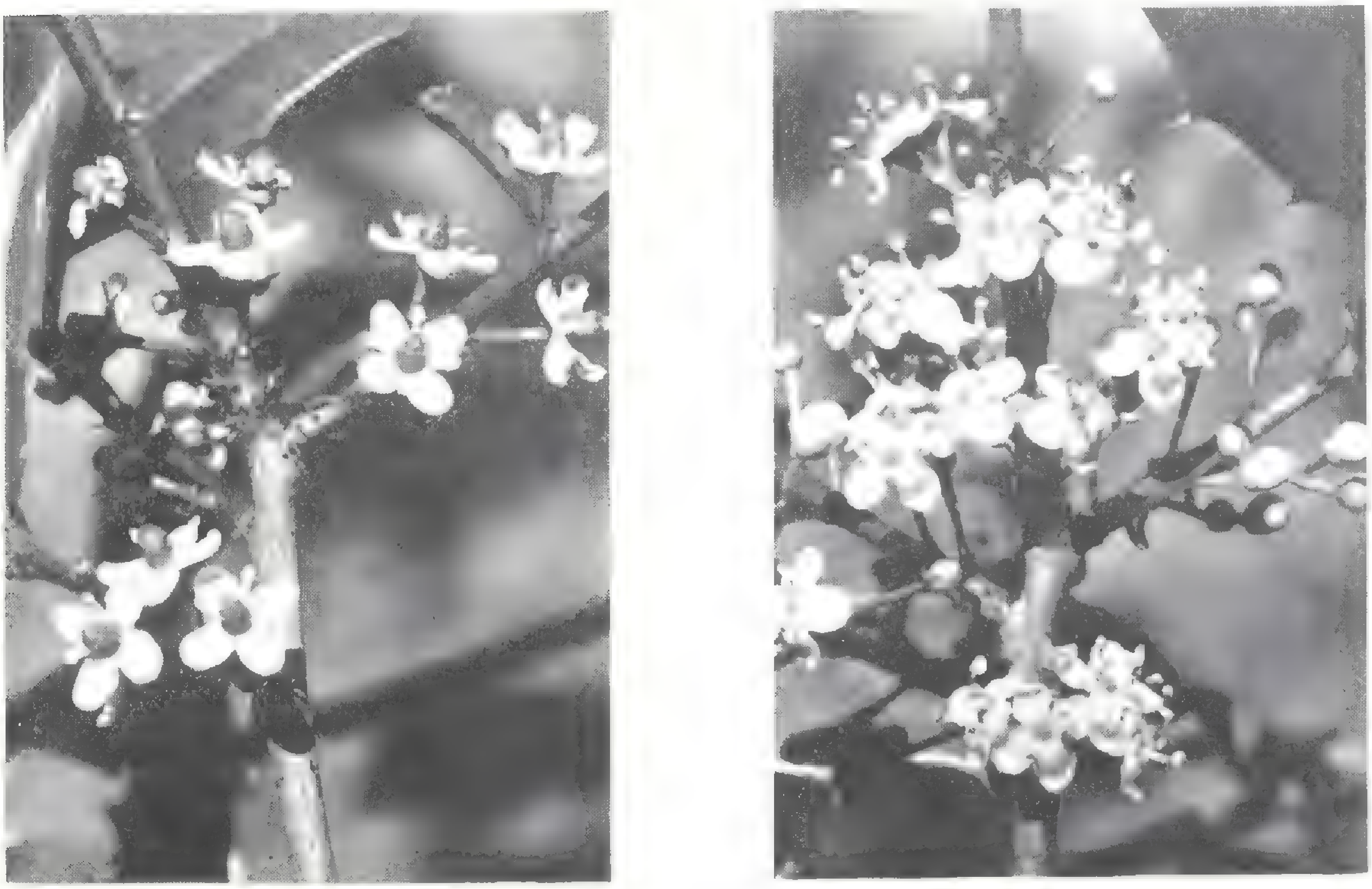
Cuttings taken in July during the peak of the growing season can be rooted very successfully by the method of mist propagation. In autumn and in winter, cuttings may be rooted under a plastic tent indoors. This ivy grows well in any good garden soil.

HOLLIES

Sex in Hollies: With a few exceptions hollies are dioecious; that is, their flowers are of two kinds, male (staminate) and female (pistillate), which are borne on separate plants. The more common conditions among flowering plants is the bisexual flower, with the male and female parts together in a single flower. In most hollies, both male and female plants are required for the production of berries, especially berries with viable seeds. But quite commonly, a small percentage of bisexual or perfect flowers occurs on female plants, giving rise to berries, but with inviable seeds. A male branch may be grafted on a female specimen in lieu of having a separate male plant, although this method has met with varying degrees of success.

14. *Ilex aquifolium* 'Balkan' (Holly Family). 20 feet. **Balkan Holly.** Missouri Botanical Garden Introduction, 1936. Southeastern Europe.

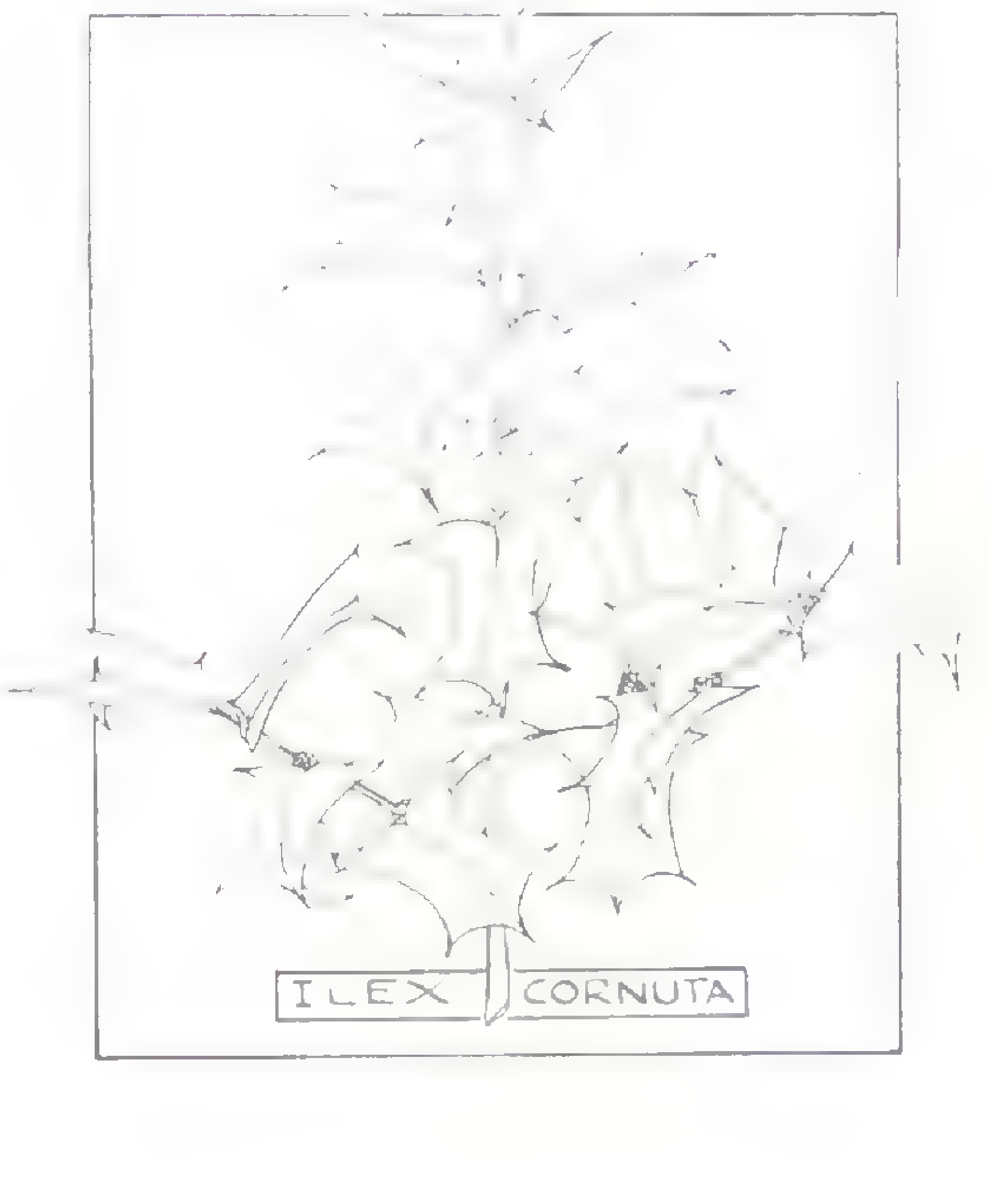
Ilex aquifolium, commonly known as the English Holly, is an extremely variable species with a wide geographical distribution, extending from Great Britain southeastward across Europe to Asia Minor. The form occurring on the Balkan Peninsula may be considered a geographical variant of the English Holly. It differs from the English form by its greater hardiness and dull leaves. In our climate, the Balkan Holly is the hardiest form of *I. aquifolium* known. Except for frost damage to late autumn-grown shoots, the specimens at the Missouri Botanical Garden have thrived for the past twenty years with only slight protection. The soil requirements are the same as for other hollies.



Flowers of American Holly: left, female; right, male

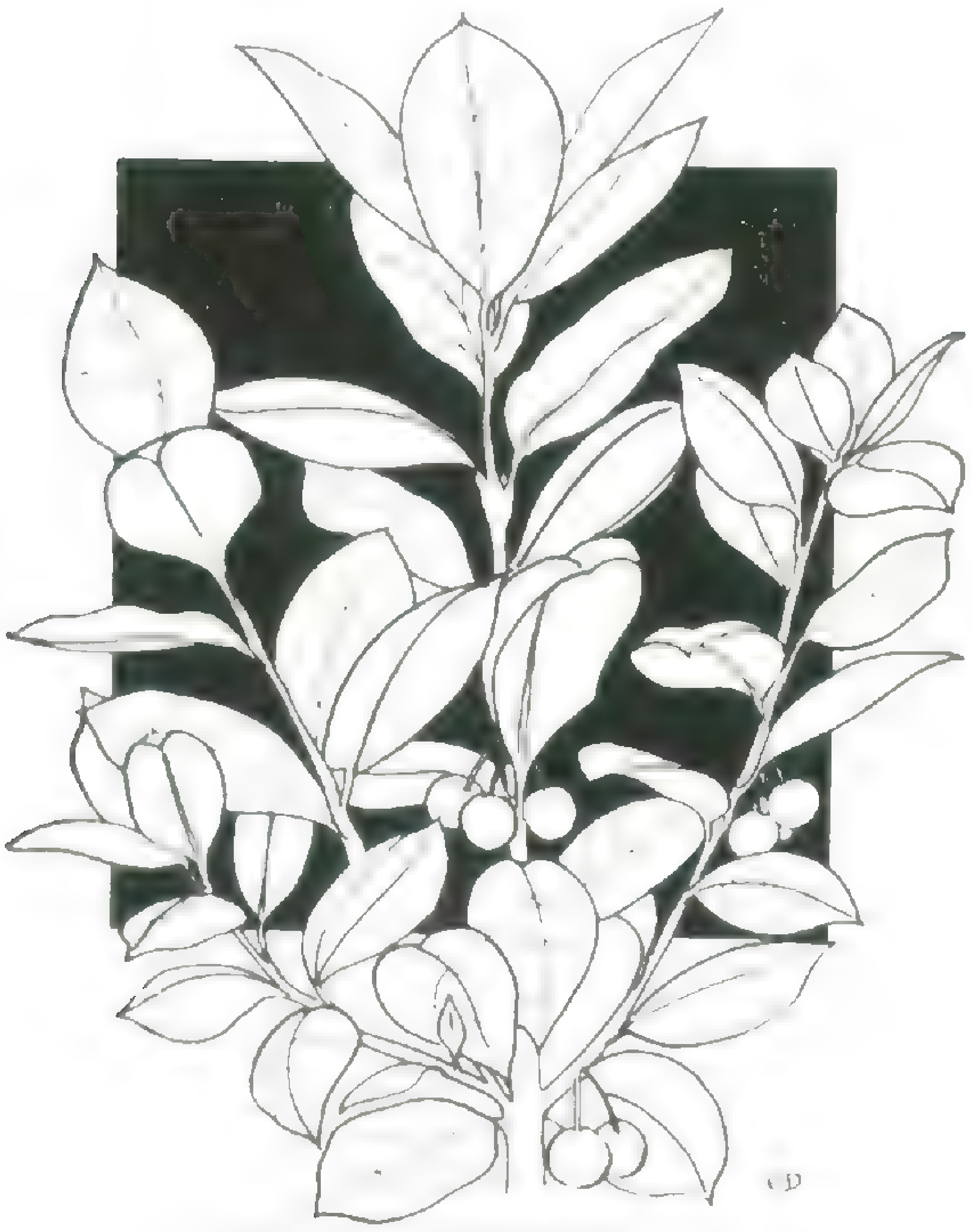
15. *Ilex cornuta* (Holly Family). 8–10 feet. **Chinese Horned Holly.** Introduced to Gardens, 1846. China.

The Bull-horn Holly, one of our most interesting introductions. Somewhat damaged in exceptionally cold winters. Densely branching, lustrous 3–5 spined leaves about 3 inches long. The dark red berries are borne in clusters which persist throughout the winter. Young vigorous specimens produce 8–12 inches of new growth a year in well-drained soil high in organic content. A well established plant can withstand full sun if protected from north and west winds. Newly planted ones require shading to prevent sun-scald during January and February.



16. *Ilex cornuta Burfordii* (Holly Family). 10 feet. **Burford Holly.** Known in cultivation, 1895. Garden Origin.

Similar in growth habit to the Chinese Horned Holly but with a short-spined or spineless leaf. A handsome holly where it is perfectly hardy and one which sets seeds regularly since both sexes are represented in the one flower. Unfortunately, recent experience has shown that in very sever winters it is badly damaged in the St. Louis area, much more so than the species itself.



ILEX·CORNUTA·BURFORDI

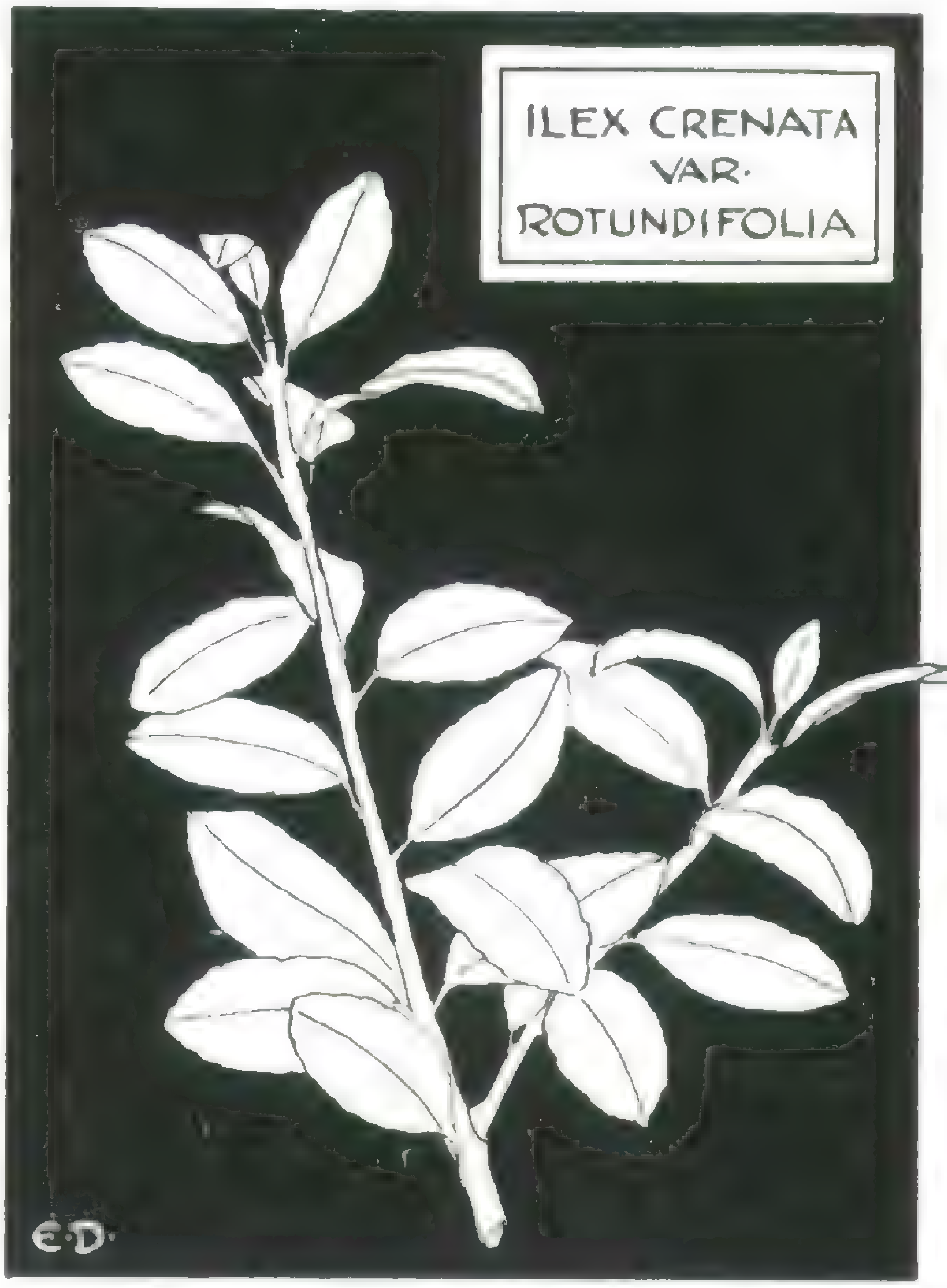
17. *Ilex crenata* (Holly Family). 2–8 feet. **Japanese Holly.** Introduced to gardens, 1864. Japan.

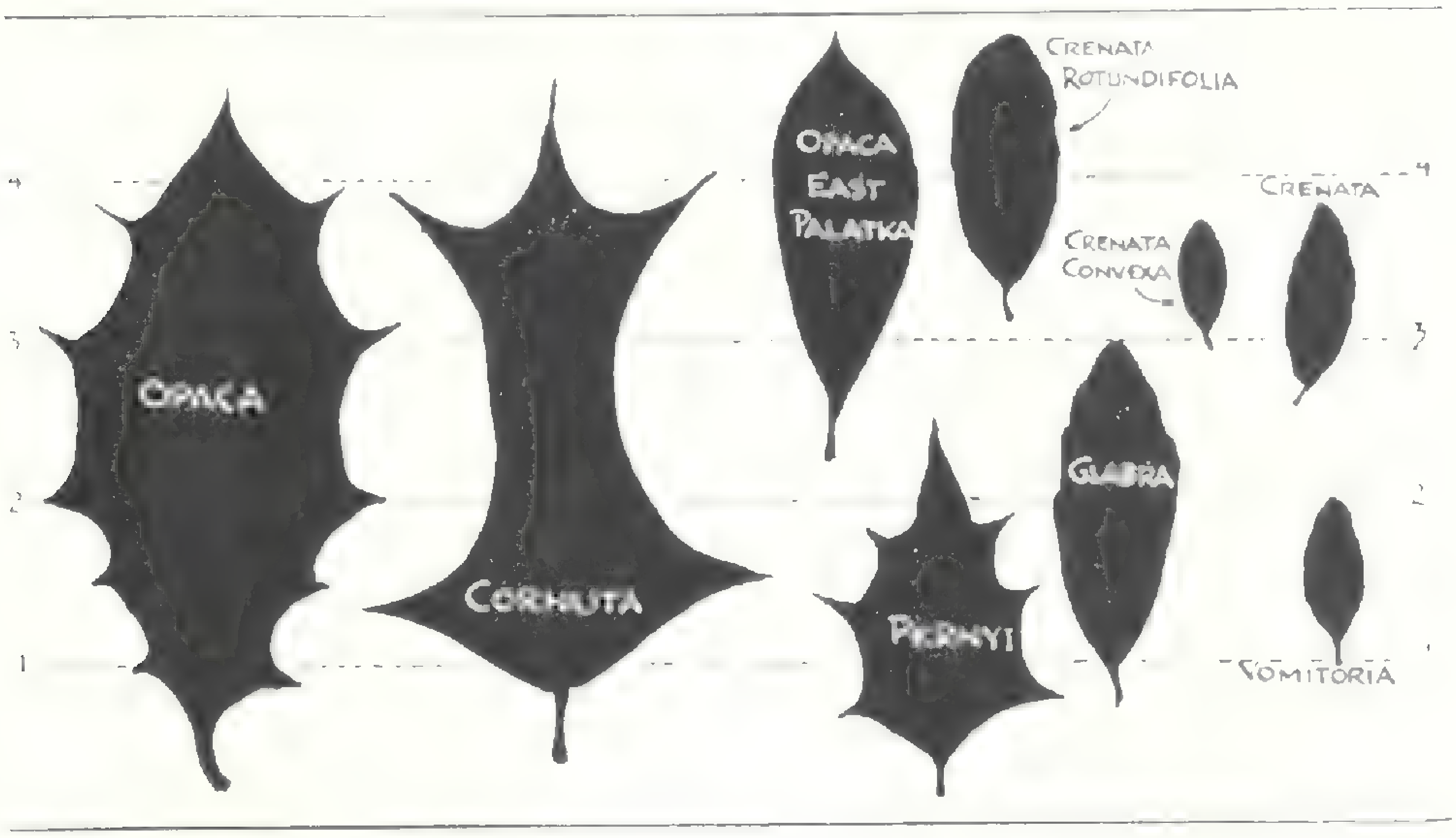
Known for the wide diversity in growth habit and leaf shape. Numerous varieties are known, all of which make good hedge or specimen plants. Should be watched as carefully as boxwood to prevent discoloration and loss of leaves by red spider. Weekly dousings of forcefully sprayed water will help but if infestation gets bad, spray every third day with Malathion until under control.

Varieties.—'Rotundifolia.' Leaves ovate pointed, 1¼ inches long, flat. Plants 6–8 feet, largest of the cultivated forms. Tolerates nearly full sun in summer but requires winter shade.

'Convexa.' Leaves ovate without a point, about ½–1 inch long, convex on the upper surface; plants 3–4 feet high with a spreading top. Needs more shade in summer than *'Rotundifolia.'* Excellent for a low hedge.

'Microphylla.' Leaves a little smaller than *'Crenata,'* narrower and flatter. Has done very well at the north entrance of the Museum Building at the Garden, where it has partial shade and





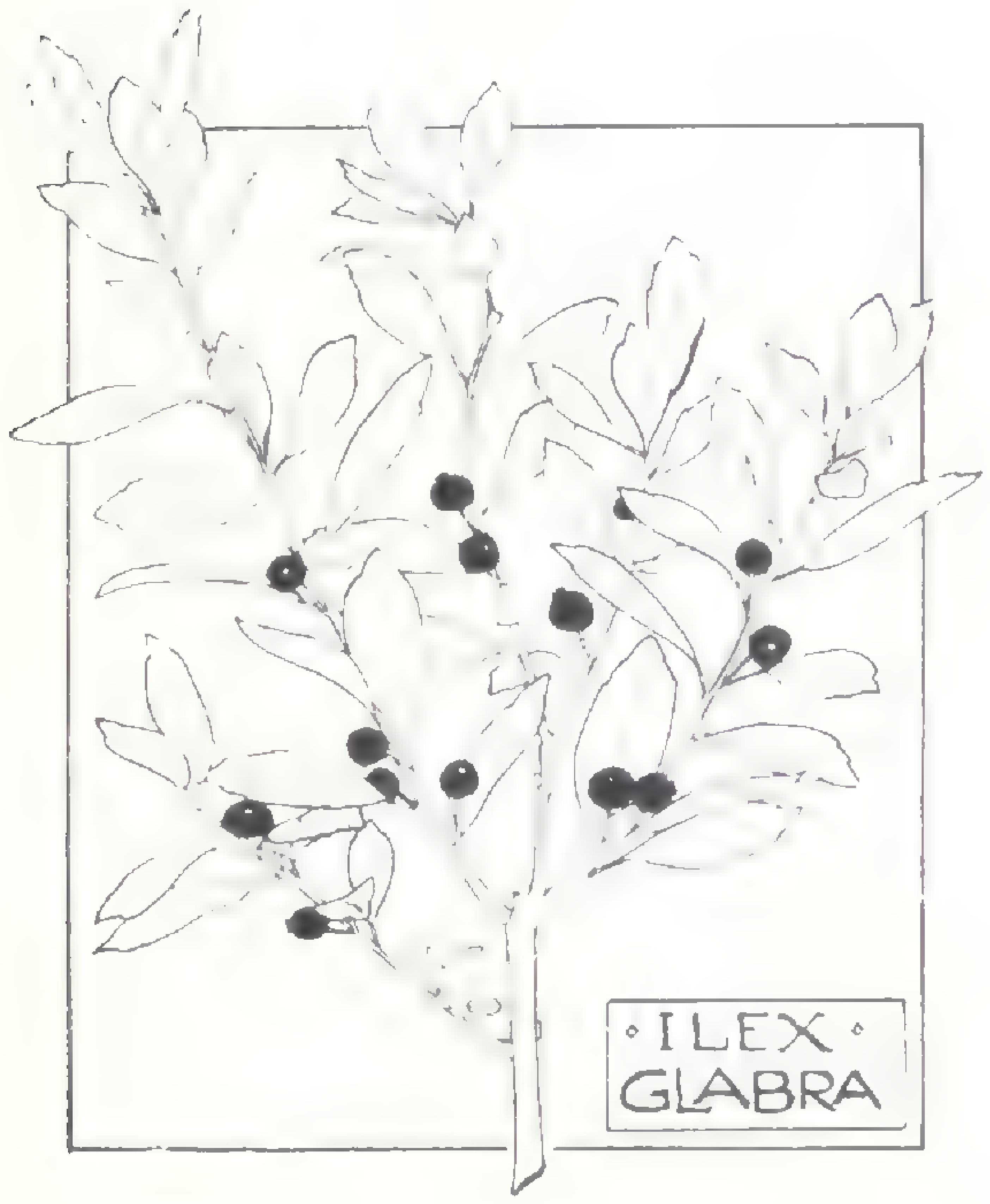
Size relationships of holly leaves

is well shielded from drying winds out of the southwest.

Several other named forms are available from nurserymen.

18. *Ilex glabra* (Holly Family). 4–6 feet. **Inkberry.** Introduced to Gardens, 1759. Southeastern United States.

One of the black-berried native American hollies, known for the dense bushy habit, reminiscent of the Japanese Holly *(Ilex crenata)*. The leaves are about 2 inches long, blue-green and dull. Relatively unknown in gardens here, probably because the dull foliage is less attractive than the Japanese Holly and other broad-leaved evergreens with small lustrous leaves. For hardiness the Inkberry ranks near the top of the list. Furthermore, plants are easy to establish and growth up to 6 inches a year may be expected in young plants. Does best in a fairly acid soil. Drought-resistant and does not sun-scald in winter; excellent for hedges.



19. *Ilex opaca* (Holly Family). 20–30 feet. **American Holly.** Introduced to Gardens, 1744. Eastern United States.

Known for the evergreen, spine-tipped leaves and red berries. It is the hardiest of the broad leaved trees grown in our area. The finest specimens are produced in full sun. Fewer

Ilex opaca

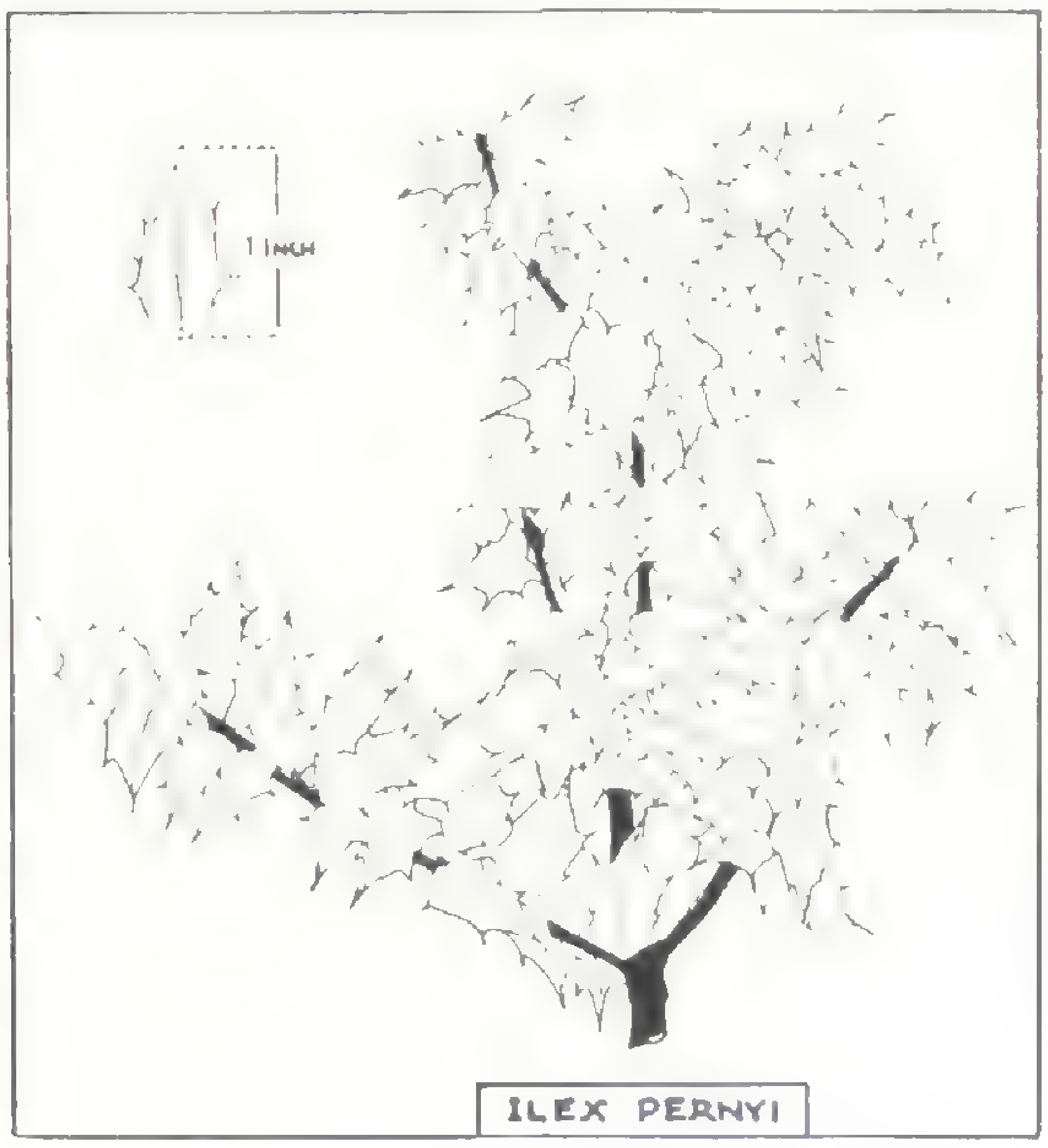
leaves and berries result when specimens are grown in shade, and the plants tend to become somewhat leggy. In full sun the American Holly remains green and does not sun-scald or discolor in summer or winter. It may be planted as a lawn specimen, but is also ideal as a hedge plant. Young seedlings grow 6–8 inches a year. Does best in acid soil. The American Holly is native to southeastern Missouri.

Varieties.—Many named varieties. Outstanding are 'Arden,' 'Clark,' 'Croonenberg,' 'Griscom,' 'Hedgeholly,' 'Hookstraw,' 'Howardii,' 'Manig,' "Merry Christmas,' 'Old Heavy Berry.' Many others available from specialists.

Insect Pests.—The leaf-miner is often rather bad. It disfigures and injures leaves. The eggs are deposited by winged insects on lower leaf surfaces; then the worm-like larvae hatch and tunnel between the upper and lower leaf surfaces. The following spring when new leaves are about 1/4 inch long, a winged form emerges, breeds, and deposits eggs on the underside of a new leaf. A second brood frequently flies early in July. The winged form lives only a few days. To prevent damage, spray with DDT and a spreader-sticker to hold it in place during showers and wind or give sprays of Malathion each third day during the time that eggs are hatching. It is also recommended to burn infested leaves which fall from the plant.

20. *Ilex pernyi* (Holly Family). 8–10 feet. **Pernyi Holly.** Introduced to Gardens, 1900. China.

Similar to the American Holly in leaf shape, but much smaller. Leaves about 1–1½ inches long, lustrous and spine tipped. Not quite hardy in our area. Demands full shade in winter and half sun in summer. A site on the south side of a wall near a high hedge or in the shadow of a dwelling with further protection by high trees will aid in preventing sun-scald to the leaves in winter. 'Aquapern,' a hybrid with English Holly, shows promise of being a little hardier than 'Pernyi.' An acid well-drained soil high in organic matter is recommended.

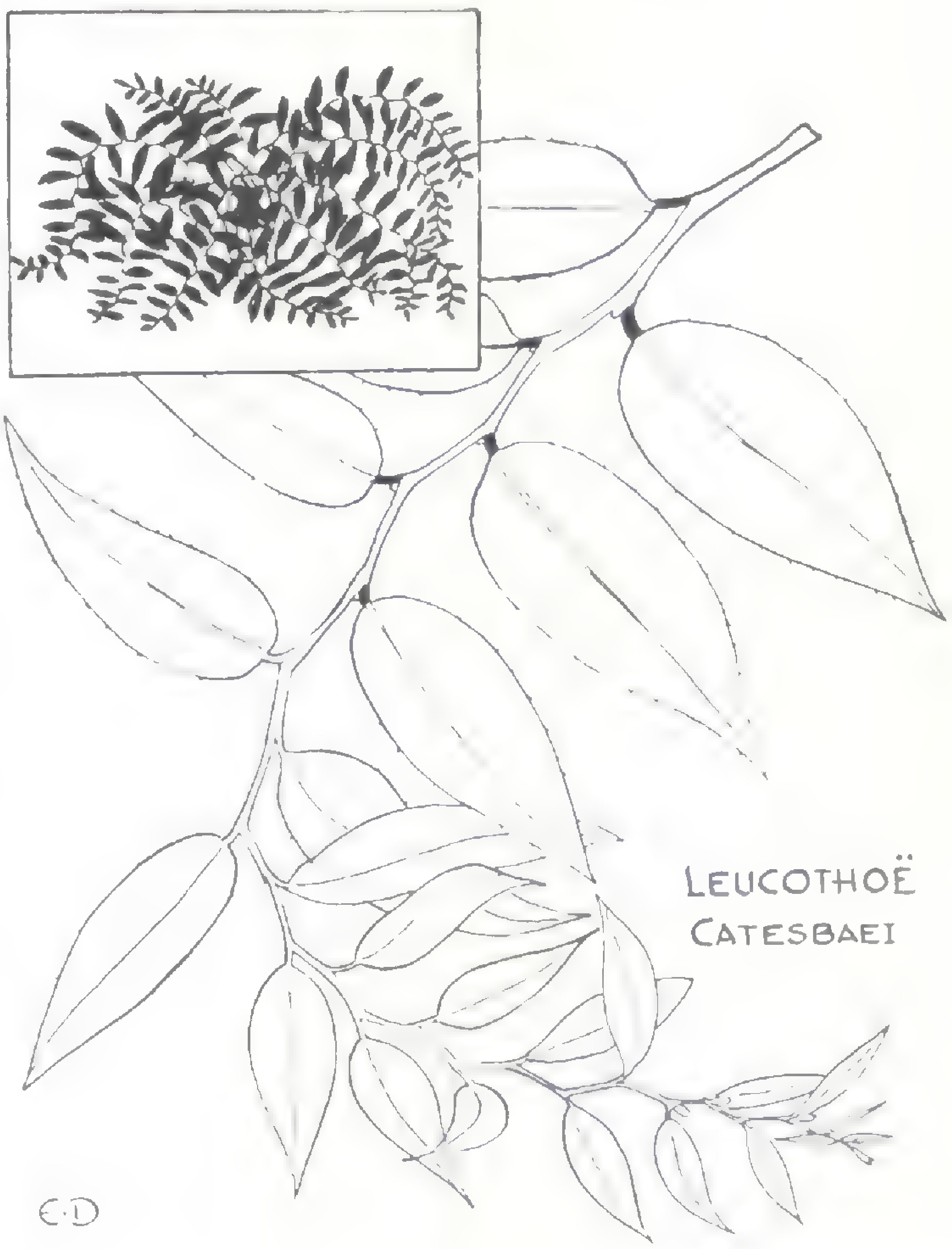


21. *Kalmia latifolia* (Heath Family). 5–6 feet. **Mountain Laurel.** Introduced to Gardens, 1734. Eastern United States.

When well-grown, the Mountain Laurel is one of the finest of flowering shrubs. Although hardy throughout our area, this plant never develops the vigor here that it does farther east. It objects to drought and will sun-scald in winter sun; grow it in complete shade with protection from strong winds at all times. If cultural requirements can be met, quite respectable plants of the Mountain Laurel can be grown in our climate. The clusters of cup-like light to deep pink flowers in May are the most distinctive feature of this plant. It prefers a well-drained acid soil.

22. *Leucothoë catesbaei* (Heath Family). 2–4 feet. **Drooping Leucothoë.** Introduced to Gardens, 1793. Southeastern United States.

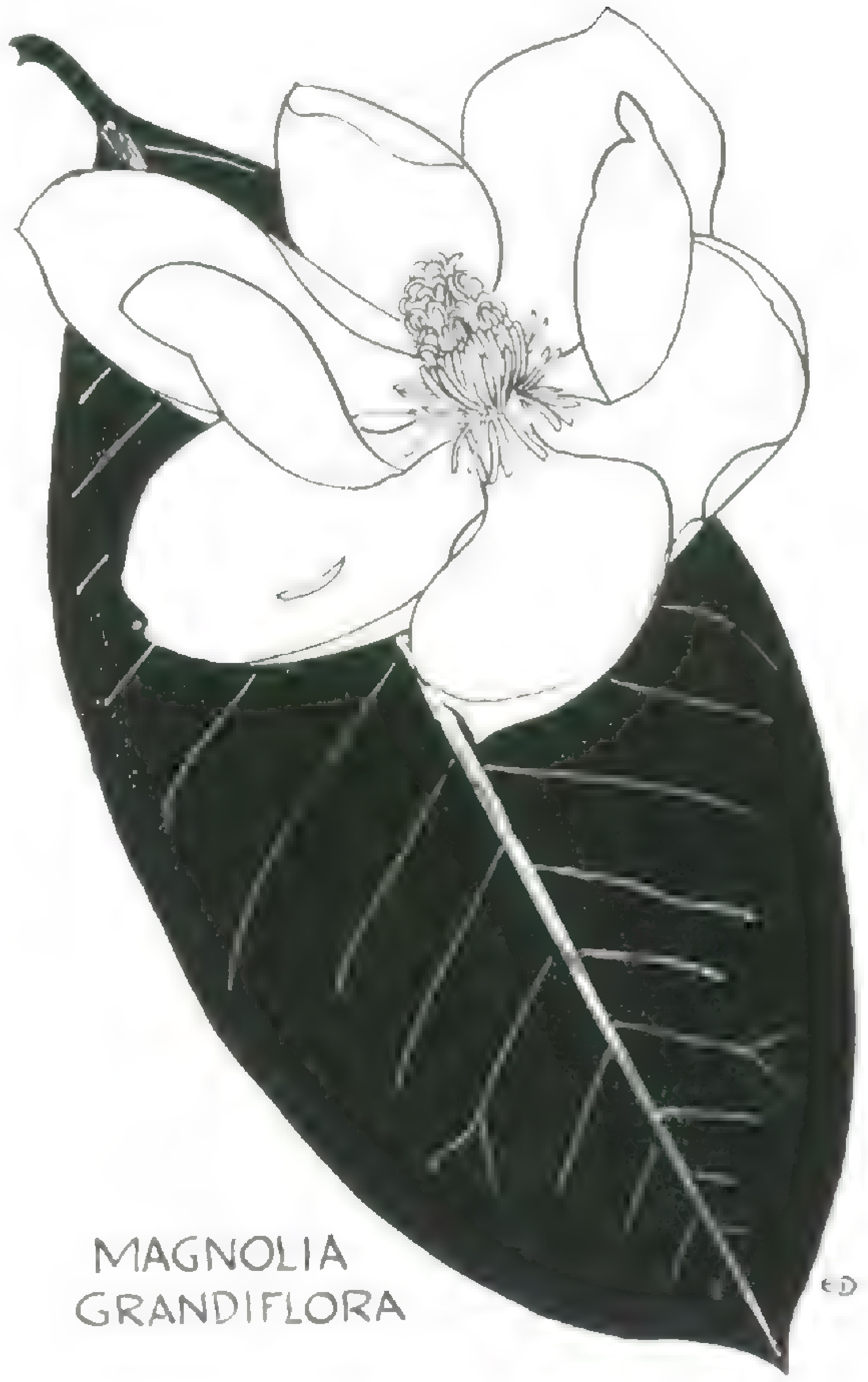
Well-established plants develop an



interesting mound-like habit of growth. In May, the pendant trusses of creamy-white Pieris-like flowers are borne at the ends of the arching smooth green branches, and contrast with the sage-green willowy leaves, 2–4 inches long. It is rather slow to establish, but the maximum height should be attained in less than ten years. Sun will burn the leaves, summer or winter, but it is completely hardy throughout our area if planted in full shade. It can be grown with considerable effect in a woodland landscape or as a low hedge along a shaded border; a bank or slope would suit the natural arching habit of this species. Spreads by underground runners.

23. *Magnolia grandiflora* (Magnolia Family). 20–30 feet. **Southern Magnolia.** Introduced to Gardens, 1734. Southeastern United States.

A small tree in our area, highly esteemed for the handsome leathery leaves and waxy-white fragrant flowers, six to eight inches across. Leaves from 6–12 inches long and 4–5 inches wide are most common, but forms with leaves 2–3 and up to 6 inches wide sometimes occur. Brownish felt-like tomentum on the underneath surface of the leaves lends considerable beauty to some variants, but in other forms the leaves are completely glabrous on the lower surface. Flowering occurs mostly in June, but may continue sporadically all summer. In late summer and autumn, the seeds with their bright red arils further enhance the plants as they protrude from the brownish, felted cone-like seed pods. Plants less than ten years old are relatively tender and may freeze to the ground, but the roots are rarely killed. In winter, protection should be provided in the form of a burlap-covered frame. Older specimens rarely freeze back, although the leaves may turn brown during severe winters. An acid well-drained soil suits this magnolia. It should be planted in full or partial shade, since flowering is prevented in full shade.

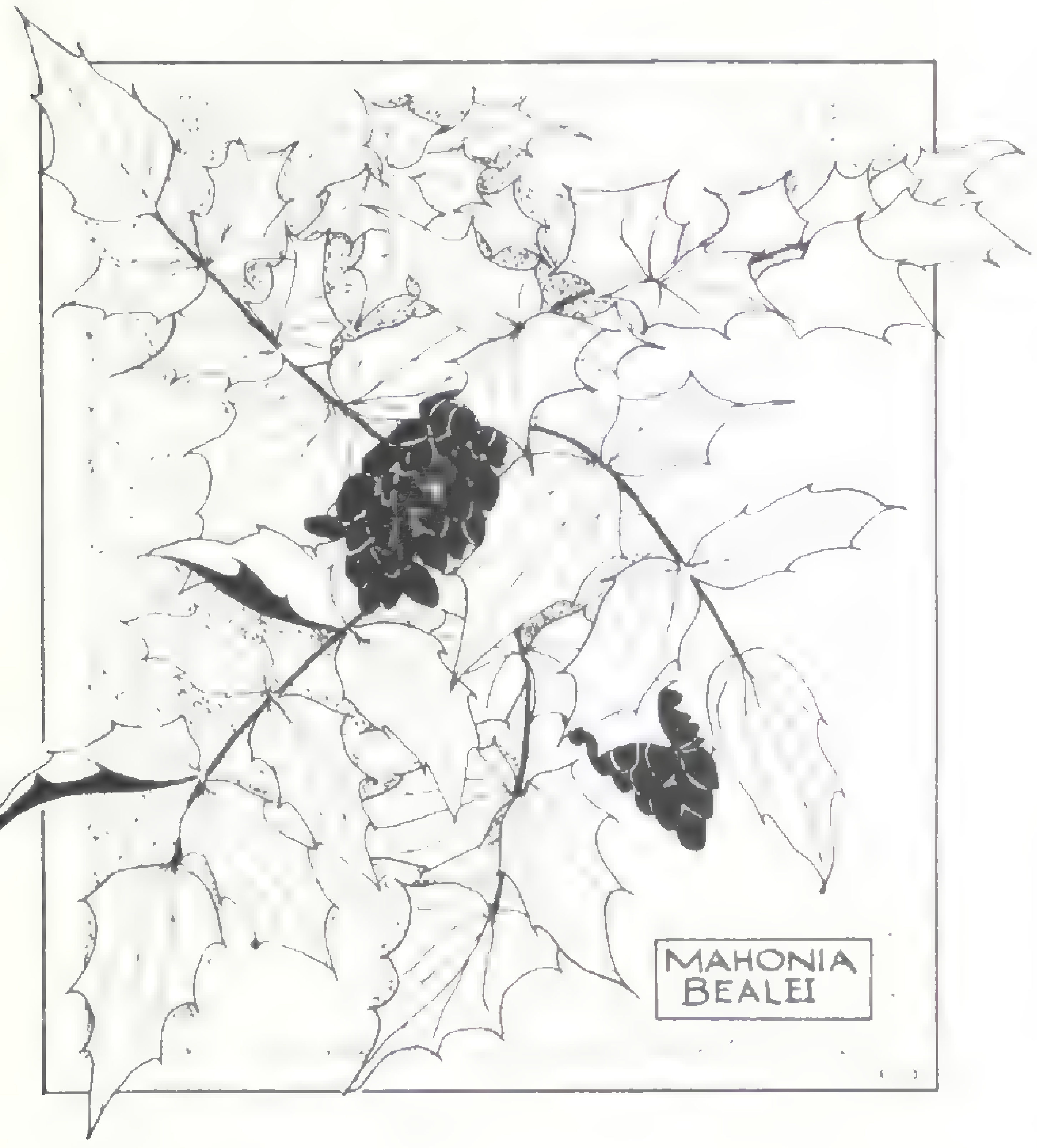

MAGNOLIA GRANDIFLORA

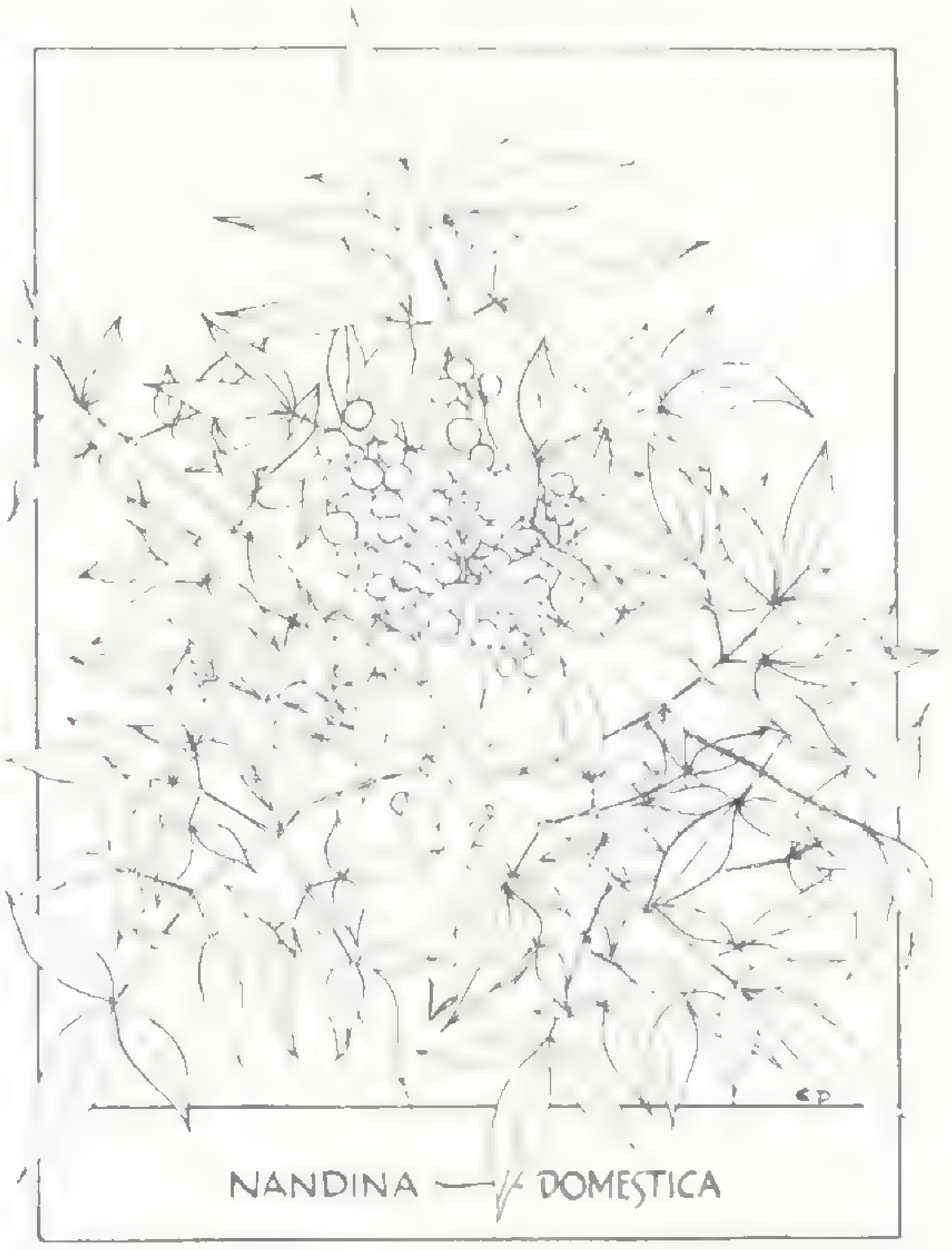
24. *Mahonia aquifolium* (Barberry Family). 4–8 feet. **Oregon Grape Holly.** Introduced to Gardens 1823. Western United States.

A stiffly erect shrub spreading from rhizomes and suckering to form a dense bushy specimen or colony. Known for the lustrous, pinnately divided spine-tipped leaves, the plant is extremely variable as to leaf shape and habit of growth. Racemes of chartreuse flowers are produced in early spring, followed in June by clusters of succulent blue berries which are useful for making a mild-flavored jelly. Mature plants may be grown in about ten years. One of the few broadleafs fully hardy in either full sun or shade. Throughout our area the largest plants develop in semi-shade. In full sun the leaves turn maroon to brick-red in winter. Very adaptable in most well-drained slightly acid to alkaline soils.

25. *Mahonia bealei* (Barberry Family. 4–5 feet. **Japanese** or **Leatherleaf Mahonia.** Introduced to Gardens, ca. 1660. China, Japan.

Similar in aspect to the Oregon Grape Holly, but with stiffer, larger, thicker leaves, larger flowers and fruit. The handsome waxy leaves are about 12 inches long, somewhat drooping, whitish blue-green underneath and dull green above. Racemes of yellow flowers are borne at the summit of the plant in April. Grape-like clusters of blue berries follow in early June. In rich soil a growth of 6 inches a year may be expected. Completely hardy if planted in shade; but winter sun burns the leaves. Grows superbly on the north side of a dwelling or in a woodland beneath deep-rooted trees such as oaks and hickories, in well-drained soil high in organic matter.



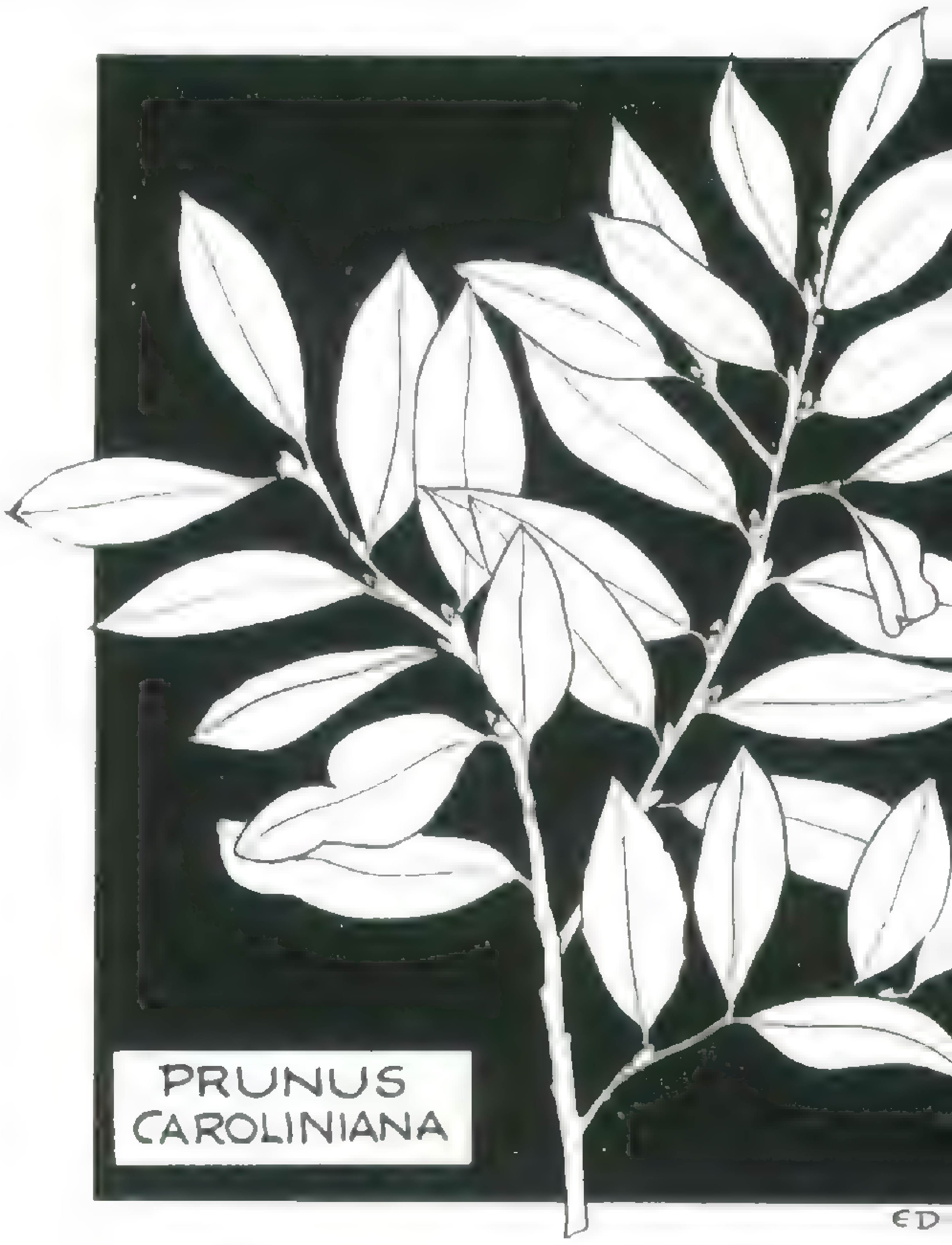


26. *Nandina domestica* (Barberry Family). 4–5 feet. **Nandina.** Introduced to Gardens, 1804. China, Japan.

Known for the much-divided, almost fern-like leaves which radiate in densely tufted whorls mostly at the summit of the plant. Sometimes called "Heavenly Bamboo." Tiny, yellowish-white flowers bloom in May. During the autumn and winter, heavy pyramids of striking orange-red berries rise from the central tuft of leaves. This shrub is slow to establish in our area and young plants normally drop their leaves and may freeze back, but they become hardier after a few years in a permanent location. Plant on the north or east side of a building if nearby trees provide shade. It does best in well-drained soil with about 50 per cent organic matter. A much-prized and ubiquitous dooryard plant farther south; a yellowish-fruited form exists.

27. *Pieris japonica* (Heath Family). 3–6 feet. **Japanese Pieris.** Known in Gardens, 1870. Japan.

This flowering evergreen, although one of the most difficult to grow here, is highly prized for its foliage, cream-colored flowers, and graceful arching branches. In spring the new terminal shoots appear, pink-tinged and erect like flaming candles in contrast with the pendulous racemes of creamy white flowers that resemble lilies-of-the-valley. Young vigorous plants may grow 5–6 inches a year. A well-grown plant may reach 6 feet after 10–12 years. Early fall and late spring freezes ordinarily damage Pieris more than minimum temperatures of mid-winter. Shade to prevent sun-scald is required at all times. A location on the south side of a wall, near a board fence, high hedge or by a dwelling with further protection on the west and north by trees is recommended. Grows best in well-drained, acid soil. Dislikes drought.



28. *Prunus caroliniana* (Rose Family). 8–10 feet. **Carolina** or **American Cherry-Laurel.** Introduced to Gardens, 1800. Southeastern United States.

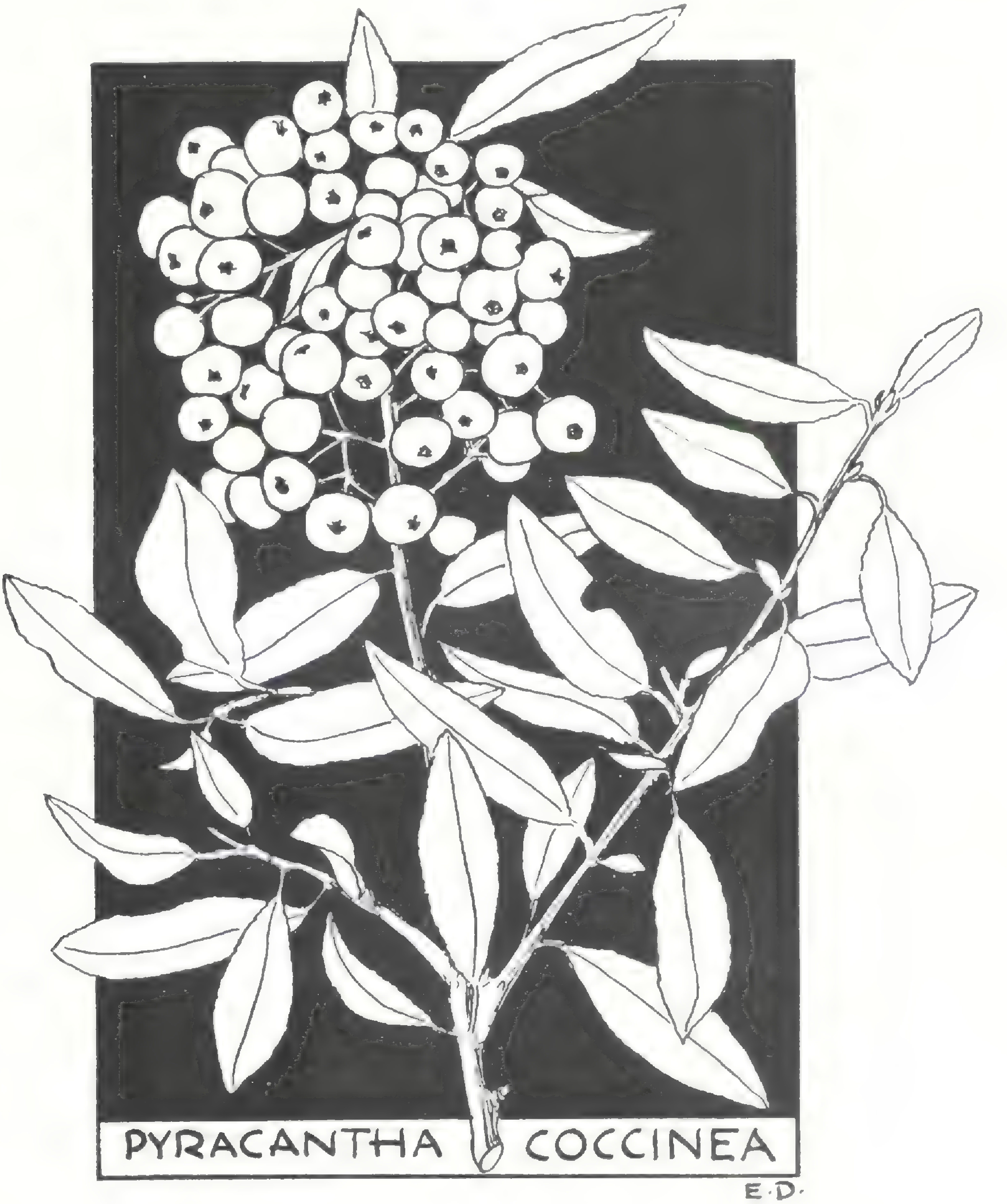
A large round-headed spreading shrub with lustrous green, leathery, cherry-like leaves, 2–3 inches long and nearly 1 inch wide. Sprays of pinkish white flowers appear on the branch ends during May. Fairly hardy, although young plants require protection from winter sun and freezing winds. Hardiness increases with age as plants acquire more bark and hard wood. Plant on the north side of a wall or stockade fence or near a high hedge. On the south side of a dwelling it should have shade to prevent sun-scald. Needs perfectly drained neutral soil.

29. *Prunus laurocerasus 'Sckipkaensis'* and *'Zabeliana'* (Rose Family). 4–6 feet. **Bulgarian Cherry-Laurel.** Introduced to Gardens, 1898. Southeastern Europe.

Cultivated for the lustrous leathery, evergreen laurel-like leaves 3–4 inches long. The '*Schipkaensis*' differs from '*Zabeliana*' in leaf width, two to three inches wide in the former and usually about an inch wide in the latter. Well-developed specimens of both varieties form an irregularly shaped, often flat-topped plant nearly as wide as high and not unlike Pfitzer Juniper in aspect. Fairly rapid growing (3–6 inches a year) it should be grown like the Carolina Cherry Laurel. These are very desirable plants with considerable promise in our area.

30. *Pyracantha coccinea* (Rose Family). 8–10 feet. **Fire Thorn.** Introduced to Gardens, 1629. Southeastern Europe.

The typical form develops as a round-headed, sprawling shrub with widely spreading branches. Clusters of small white flowers cover the plant



in May. Masses of orange to reddish berries which appear on the short spurs decorate the plant from early autumn throughout the winter. It is fast growing; a foot a year may be expected from a young plant in fertile, well-drained soil, pH 6.0–8.0. Fully hardy throughout our area, it thrives best in full sun and is hardly worth planting in shade. Extremely useful for a fast-growing clipped hedge, as a dense, unclipped screen, or as a specimen plant on the south side of a building where it is difficult to grow other plants in full sun. Highly drought-resistant. Can be successfully espaliered against a wall. It is perhaps the finest berried evergreen shrub for our area, but is susceptible to fire blight.

Variety.—'Lalandii,' more upright and the branching habit less divergent than in the typical form.

31. *Viburnum rhytidophyllum* (Honeysuckle Family). 6–8 feet. **Leatherleaf Viburnum.** Introduced to Gardens, 1900. China.

An interesting shrub with unusually large deeply veined leathery drooping leaves, sometimes 8–10 inches long. Forms a dense, round-headed bush. The twigs and underside of the leaves are covered with a felt-like tomentum. The upper leaf surface is dark green with deep-set veins. During the growing period the leaves are attractive, but during the winter the leaves hang down unattractively and during severe cold can appear almost as if dead. The small trusses of white flowers in May are not especially attractive, but the masses of red berries that develop in late summer contrasts strikingly with the dark green leaves. Fast growing; the maximum height may be reached in 6–8 years. Fully hardy, growing best at the edge of a woodland, on the north or east side of a dwelling or near a hedge. Should have protection from sun at all seasons. One of the toughest broadleafs grown here, it does best in slightly acid soil.

BROAD-LEAVED EVERGREENS IN SOUTHEASTERN KANSAS—A FRINGE AREA

As compared to the St. Louis area, the climate of Kansas City is drier, and the frequency of of strong west winds makes growing of introduced trees and shrubs considerably more perilous than 250 miles east. It is interesting to record below a few kinds of broadleafs that are being grown successfully at Ottawa, Kansas, about 60 miles southwest of Kansas City, in a climate where all but the most adventuresome of plantsmen would say it couldn't be done.

1. *Ilex crenata 'Rotundifolia'* and *'Helleri'*—both very desirable.
2. *Ilex cornuta*—needs heavy protection.
3. *Ilex opaca* 'Bountiful,' 'Cardinal,' 'Clarke,' 'Hookstraw,' 'Merry Christmas'—withstands full sun without burning.
4. *Kalmia latifolia*—requires much protection.
5. *Leucothoë catesbaei* — requires full shade where it does well.
6. *Magnolia grandiflora*—needs protection when young.
7. *Mehonia aquifolium*—does well.
8. Rhododendrons and Azaleas—old iron-clads and some of the Kuremes do well with adequate sun and wind protection.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 9:00 P. M. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

May, 1963
Volume LI
Number 5

THROUGH THE GARDEN GATE

COVER: THROUGH THE GARDEN GATE. The garden gate near the Tower Grove House at Shaw's Garden is a reminder that the annual Through the Garden Gate sale opens Wednesday, May 8, and runs through the 11th, on the east parking lot of the Famous-Barr Clayton store. Members of the Women's Association have been working since last July on this sale, which will include plants of every description, herbs and herb preparations, handicrafts, garden supplies and equipment as well as a cafe and gardening information. The hours of the sale are 9:30 A. M. to 9:30 P. M. except for Saturday, when the booths will close at 5:30. PHOTO BY BRIAN GORDON

CONTENTS

Biological Clocks
Summer Educational Programs For Children
Feather Geranium—Jerusalem Oak
Friends of the Garden Notes

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: BRIAN GORDON.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden
Vol. LI No. 5 Bulletin May 1963

BIOLOGICAL CLOCKS

LILLIAN OVERLAND

PLANTS and animals are able to tell time; not only can they distinguish the time of day but also the seasons. For instance, many birds migrate seasonally, some animals hibernate, while others display a variety of rhythmic daily activity, such as the crowing of the cock. Among plants, the onset of dormancy in many deciduous species coincides with the shortening of daylength toward the end of summer. Leafing out and flowering follow specific seasonal patterns, and daily periodic responses such as leaf movement and flower opening and closing are common. These are but a few of the many known cases which indicate the ability of living organisms to perceive the passage of time. Unlike man, who in his frequently artificially created environment has come to depend largely on clocks and calendars as an aid to recording time, other living organisms seem to possess a mechanism whose accuracy rivals that of the most intricate man-made machine. In fact, were it not for the high degree of artificial complexity of man's social structure, he too could readily dispense with his mechanical clocks and rely on his innate one without any harm. Thus, most people can awaken at a precise time without the help of an alarm clock; they become hungry and sleepy at the same time of day, and this timing is upset when they travel from one time zone to another.

What is the nature of this hypothetical biological clock which enables living organisms to tell time? Does the same mechanism that controls the vitally important yearly migrations of birds to warmer climates also coordinate the apparently biological nonsignificant daily leaf movements of certain plants? Are the various functions of an organism controlled by a single master clock or by a number of independent ones? Such questions cannot as yet be answered conclusively. But with increasing knowledge, it is becoming clearer that the biological clock is a fundamental property of all living organisms and it seems to be intimately related to the innate rhythms found in all of them. The exact nature of the clock remains one of the most intriguing and significant problems of biological research today.

Since the natural environment is fundamentally cyclical as a consequence of the earth's rotation and revolution, it is not surprising that living organisms in the course of evolution should have developed compatible rhythmic responses. Indeed, it would be much more surprising if this were *not* so, for the response of organisms to the environment is now known to be of vital importance. Nonrhythmic organisms trying to exist in a rhythmic environment would be much like a swimmer trying to avoid the impact of a strong wave by bracing himself rigidly. The result can be readily visualized. The living organism must also learn to "ride the waves" in order to survive in a rhythmic environment.

Although man has long been aware of the rhythmic nature of life, it is not until relatively recently that scientists have begun to realize its great degree of significance in the search for a fuller understanding of nature. In 1932, Professor E. Bünning of Germany performed some simple but highly significant experiments which proved that the rhythms in question are innate to the organism and not simply responses to environmental conditions. He germinated and grew beans in total darkness and constant temperature, and after the first two leaves had developed, connected them by fine wires to a rotating drum and pen which could record any leaf movement. Under these cueless conditions of darkness and constant temperature, the leaves were found to go through the same daily cyclical movements that beans normally do in the natural environment. Now, whereas in nature such leaf movement might conceivably be of biological significance in terms of capturing the maximum amount of light for photosynthesis, there could be no such benefit to the plant in darkness. Such a biologically meaningless response must thus be a manifestation of a fundamental rhythm within the organism. Or, as Professor Bünning explains it, this response should be looked upon as the "hands of the clock" which, like hands of a mechanical man-made clock, demonstrate the workings of a more intricate mechanism within.

Following this classical experiment, countless other observations have been made on a large variety of living organisms, both plants as well as animals. There is no longer any doubt about the existence of such innate rhythms, which are referred to variously as the Bünning cycle, endogenous rhythm or, more recently and more accurately, as the circadian rhythm, indicating an approximately 24-hour cycle. Just a few of the many known examples are luminescence in the alga, *Gonyaulax*, growth and sporulation of the fungi, *Pilobolus* and *Neurospora*, mating activity in *Paramecium*, changes in pigment of the fiddler crab, transpiration of lemon cuttings, photosynthesis in *Gonyaulax*, cell division in *Chorella*, opening and odor production in flowers of *Cestrum nocturnum*, and many others. As in the case of the leaf movement of beans, all of these show a circadian rhythm under constant cueless conditions.

Even more convincing evidence of the existence of circadian rhythms, and of special significance with respect to heredity and evolution, is an experiment in which fruit flies *(Drosophila)* raised in constant environment for fifteen generations still continued to show a rhythm under such conditions. Finally, the recent discovery of a 24-hour rhythm in cave crayfish *(Orconectes pellucidus)*, generations of which have lived for millions of years in the total darkness and essentially constant temperature of caves, very strongly supports the theory of the universal presence of circadian rhythms.

In man, evidence for circadian rhythms is perhaps less precise because of a lack of controlled experiments. As mentioned earlier, however, the rhythmic nature of daily biological processes such as wakefulness and hunger are beyond dispute, and to this might be added such intangibles as memory (for instance recalling a concert heard one or more days previously). Corresponding specific rhythms in such physiological indicators as body temperature, blood sugar content, etc., are also now well known in medicine, and will doubtlessly become more useful in diagnosis and treatment as a greater overall understanding is achieved.

Thus, both through scientific demonstration as well as through intuitive awareness, there remains little doubt as to the existence of the function of rhythm in life. The next question, of course, is just what is this rhythm and specifically how it is related to biological clocks.

At present we can only speculate as to the answers to these questions, but by studying the manifestations of the clock in various organisms it is possible to gain a great deal of valuable insight into such fundamental problems as the adaptation of the organism to its environment or the ability of organisms to migrate from one location to another, and consequently, a clearer view of evolution. By learning more about how the clock operates, eventually the solution to its actual mechanism might also become much clearer. Several models have been proposed, the general idea of which involves a phase of tension followed by one of relaxation, but we are still far from a clearer understanding. All that is certain at present is that we are dealing with something that is highly complex, and by comparison, the most delicate and intricate Swiss watch is but a child's toy.

Although it is not yet possible to say what the biological clock is, it is possible to some extent to say what it is not. Thus it is not controlled by a simple chemical reaction. According to Van't Hoff's rule, a rise of 10° in temperature doubles the rate of a chemical reaction (expressed as $Q_{10} = 2$). Among the observed circadian rhythms in various organisms, however, the Q_{10} is close to or only slightly higher than 1, which indicates that the controlling process is not chemical but rather physical, such as diffusion. In other words, before the various chemical reactions of metabolism may occur, the reactant substances must first reach the site of reaction and this is either permitted or prevented by the particular stage of the rhythm. Thus, although the ultimate manifestation of the rhythm might be a specific chemical reaction, the rhythm itself is not a chemical process. As an illustration, we may take night blooming Jasmin *(Cestrum nocturnum)*. In nature the flower opens normally at night and this opening is accompanied by a very strong fragrance. The fragrance is probably the result of a chemical reaction which produces the volatile compounds. For a long time it was thought that light is necessary in order to produce an intermediate chemical which in darkness is then converted to the odorous ones. However, when kept under constant conditions of temperature and either light or darkness, the fragrance is produced on a 24 hour cycle just as it is in nature. The controlling factor clearly then is the circadian rhythm which in turn controls the production and/or diffusion of the chemicals involved in the odor production. This illustrates how the ultimate understanding of biological processes cannot successfully be approached simply by a study of the resultant chemical reactions. It is of vital importance, rather, to study the organism as a whole in relation to the environment.

It was also found in *Cestrum* that, although the odor production generally coincided with the flower opening, under certain controlled conditions the two followed cycles of different periods. This further indicates that one organism may have several separate clocks which can be synchronized by one "master clock."

We now know that innate rhythms are fundamental to all living organisms. How do such rhythms relate to the natural rhythm imposed upon them by the environment? We have seen that the endogenous rhythm (by definition) persists under totally cueless constant conditions. In nature, however, it is subject to a constantly changing natural rhythm of light–dark, temperature fluctuations, etc. If, according to our assumption, the endogenous rhythm of the organism is able to record the passage of time or, in other words, the changes in environment such as light and temperature, then there must be some synchronization or relationship between the two. This has been found to be true in the many cases studied. As long as the endogenous rhythm of the organism is synchronized with that of the environment it will continue to perform a particular physiological function, for example, vegetative growth in the case of plants. When the rhythm of the environment begins to change, such as the daylength at end of summer, the plant then is out of phase with it. This interruption of synchronization of rhythms consequently somehow changes the resultant physiological reactions and the plant responds by flowering, becoming dormant, and so on, as the case may be. What actually happens, of course, is much more complex and as yet largely unknown, but conceivably a disruption of the natural rhythm of the organism imposed by the environment is the means whereby the organism tells time and adjusts its activity accordingly. In other words, the circadian rhythm of the plant or animal is not simply a clock which tells the time, but it is a clock which at the appropriate time can initiate changes and reactions necessary for its well being. It may be compared with a clock which in the morning sets off an alarm to awaken the sound sleeper, turns on the radio to ease the waking process, and starts the coffee to make sure that he will be fully awake in time. In the case of the former, however, the clock is even more important since it assures its owner's very survival—for a deciduous plant which did not become dormant in winter would be killed by frost.

It appears that circadian rhythms existed early in the evolution of living organisms and probably such rhythms were considerably different from those of succeeding ones, which adjusted to changing environments. If, as seems to be the case, the circadian rhythm is a vital biological clock, such adaptibility would be essential to survival as the environment changed in the course of evolution. On the other hand, a clock which altered itself readily with temperature or other environmental factor would be very inaccurate and probably useless. The solution to this apparent enigma lies in the fact that although the circadian rhythm is relatively independent of temperature (as shown by a Q_{10} close to 1) it has a slight margin of flexibility which is potentially very important in adaptation. For it enables an organism to adjust its internal rhythm, within reasonable limits, to a new environment.

Such a change-over of circadian rhythm is possible after a short period of adjustment, provided the new environmental conditions are not extremely different. In general it has been found in such cases as leaf movement of beans or flower opening of *Cestrum* that the total length of the endogenous rhythm increases as the temperature is decreased and decreases as the temperature is increased. This means that an organism adjusted to the 24 hour daily environmental cycle in one climate might be so much out of phase in another that it could no longer exist. In between the extremes, however, may be a considerable range of climates which permit a readjustment of the circadian rhythm within a normal 24-hour day, thereby permitting successful migration or transplantation.

Beyond a certain limit, however, the organism can continue to exist only if the external environmental rhythm is correspondingly changed. This very important relationship of environmental and internal rhythms was clearly demonstrated by Dr. Went in some experiments performed in the controlled-environment Earhart Laboratory at Caltech. By changing the environmental cycles of light and darkness to either greater or less than the normal 24-hour one, he succeeded in growing plants of cold regions in warm temperatures, and vice-versa. In each case it was found that there was an optimal cycle length at each temperature, but also a tolerable range at which the plants could exist. Such information provides a valuable clue as to why certain plants are restricted to given climatic regions, confirming the importance of synchronization of internal and external rhythms. Thus the African violet, which normally grows only in warm climates, dies when one attempts to grow it at 10° C at a normal 24 hour daily cycle. However, by subjecting it to an artificial day of 30 hours (15 hours light plus 15 hours darkness) it does very well at 10° C. The conclusion is that the African violet has a circadian rhythm which normally is synchronized with a 24 hour environmental cycle but only at the higher temperature where it naturally grows. At a lower temperature its circadian rhythm is so much out of phase with that of the natural environment that it cannot adjust successfully, but by artificially lengthening the environmental cycle to adjust to the African violet's endogenous rhythm at the new temperature, the plant can continue to thrive. This indicates that plants growing in different climates have circadian rhythms which are adapted to 24 hour day at the particular climatic range in which they are growing. This was further illustrated by Dr. Went in a similar but opposite experiment to that of the African violet. By exposing *Baeria chrysostoma,* which normally grows in a cool climate, to a 20 hour instead of the normal 24 hour environmental light–dark cycle, it thrived at a high temperature of 30° C, whereas on a 24 hour cycle it died.

From a practical viewpoint, probably any known plant could be successfully raised under drastically alien climates provided the circadian rhythm was properly synchronized by artificial means. In the present natural environment of a 24 hour cycle, however, organisms are confined within the limits of their ability to synchronize their internal rhythms with the external ones imposed upon them. Should the earth's motion ever change sufficiently to create a non-24-hour cycle we could expect a change of distribution of existing life and probably the origin of new and better adapted organisms.

The environment, then, may be regarded as the key which winds the biological clock. When the internal rhythm, or clock, is synchronized with that of the environment, it is self-winding and the organism thrives. But, as seen above, an extreme change in environmental rhythm such as that which occurs from season to season is just enough to set the clock slightly off course or, in other words, to warn the organism to prepare for a change. Just how such a transformation actually occurs remains another of the unsolved big problems of biology. For instance, just what causes a bud to change from vegetative to flowering? So far the suspected "flowering hormone" has not been isolated and identified and it seems unlikely that one simple substance is the cause. The actual function of the biological clock is still not known in terms of *how* it directs the drastic change-over in metabolism which results in flowering, but that somehow it is involved, is highly probable.

It has further been found that the circadian rhythm can be entrained or reset to any given time merely by shifting the environmental rhythm with which it is synchronized. For example, by reversing the natural light–dark cycle under artificial conditions, a night blooming water lily can be made to bloom in daytime, or the usual night fragrance of flowers of *Cestrum* can be produced by day.

As a greater understanding of the function of environmental rhythms is reached, it is becoming increasingly clear that these rhythms are related to many responses formerly attributed to a more specific cause or single factor.

A good example is photoperiodism. As implied by its name, it refers to the response of plants (usually, but not necessarily, the flowering process) to the length of day. Significantly, its discovery was accidental and serves to stress the importance of understanding the effects of environment on living organisms in interpreting their behavior. Working in Washington, D. C., in the summer of 1920, Garner and Allard found that, whereas certain varieties of tobacco flowered outdoors, one particular one, Maryland Mammoth, remained vegetative. When grown in the greenhouse in winter, however, it did flower. Since the greenhouse temperature was approximately equivalent to that of the natural summer, they began to suspect that the length of day might be involved, and by further experiments found that this was indeed so. It was soon discovered that plants fall roughly into three general classes with respect to flowering: short-day plants, which require fewer than a critical number of hours of light; long-day plants, which require more than a critical number of hours of light; and day-neutral plants, which apparently are not sensitive to daylength. With this knowledge it became possible to control flowering, and today this technique is a widely employed practice of commercial growers. Not only can they produce flowers at the desired time, but by deliberately keeping plants in the vegetative state for a prolonged period before treating for flowering, they can produce larger, more attractive blooms.

In view of such tangible evidence, it appears that the external cause at least of flowering was a simple response to light. The receptive phase during which light is believed to be beneficial is referred to as the photophil phase, while the dark-requiring phase is named the skotophil phase.

But, as so very often occurs in studying the complexities of biology, just as a problem appears to be solved, additional discoveries reveal that it is far from being solved after all. In the case of photoperiodism, some surprising discoveries made with respect to internal and external rhythms have pointed the way to a broader interpretation. For example, many short-day plants such as *Pharbitis*, which normally require a short daylength in order to flower, were found to produce flowers in continuous light provided they received an alternating temperature cycle. A slight interrupation of short-day plants by only a small amount of light during the dark period prevented flowering. Day-neutral plants, like the tomato, grew very poorly in continuous light but even worse if given a non-24-hour cycle of either light or temperature fluctuation (e.g., 6 hours light plus 6 hours dark, and so forth), whereas a cycle based on a more natural 24 hour one caused them to thrive.

From such observations it is clear that it is not light alone which is the prime factor causing flowering, but rather it is merely one of many stimuli and can readily be substituted for by another, such as temperature. The important factor actually is the operation of the biological clock through synchronization of the internal and external rhythms. In other words, although the effect of light through photoperiodism is definite in nature, it is the "periodism" aspect of it which should be stressed.

The practical applications resulting from a better understanding of biological clocks are tremendous in scope. In addition to such luxuries as being able to grow exotic plants out of their natural habitat or enjoying night blooming flowers by day, there are some potentially fundamental applications in medicine and sociology. For example, it is now known that not only are there daily cycles in body temperature, hormonal activity, excretion, etc., but that metabolism of fats, sugars, and some hormonal secretions vary considerably from season to season even if factors such as food and temperature remain constant. The exact relationship of disease to such rhythms is still not understood, but there are many indications that it may play an important role. This is evidenced in the recurrence of many chronic diseases or, more directly, in experiments with plants in which the number of lesions produced by injecting a virus infection varied with the status of the endogenous rhythm. With respect to diagnosis and treatment, it is becoming evident that the time of analysis of body fluids or administration of medicine might be very significant to the results. Consequently, rigid standards of normalcy must be re-examined and a greater emphasis placed on individual variation and life history. Even in a controlled-environment phytotron where all environmental factors can be maintained as desired the state of the rhythm must be taken into account in an experiment if duplication is desired. In other words, the important effect of the internal cycle must be given greater consideration in all cases.

When this control is achieved we can possibly expect revolutionary advances in many aspects of human life. For we now know that there is a scientific basis for a long known fact that some people are "morning people" and others "night people." Just as we have learned to control plants by photoperiodism, perhaps someday an intelligent application of knowledge of internal rhythms may be made to human problems. For man as a product of evolution in a rhythmic environment doubtlessly has innate rhythmic responses at least as complicated as those of other organisms. Even though he has learned largely to control the natural environment and to depend on mechanical rather than biological clocks, his innate rhythms cannot be ignored. Trying to subject "long-day people" and "short-day people"—to say nothing of "day-neutral people"—to one generally synchronized activity regime might be not only very wasteful of human energy, but actually deleterious to the individual. Until a major reorganization of man's habits and society becomes feasible, however, perhaps in the meantime he may at least throw out his loud alarm clocks which so rudely interrupt his circadian rhythm, and by resetting the biological clock of a strongly fragrant flower such as *Cestrum* be wakened by more gentle means.

SUMMER EDUCATIONAL PROGRAMS FOR CHILDREN

VEGETABLE gardens, nature study outdoors, programs and films on plants and animals—these are just some of the activities the Missouri Botanical Garden offers to St. Louis children throughout the year. Summer is especially a time for the action programs the Garden offers, and since the programs are popular, it is good planning to register early for the programs which require advance registration.

This will be the sixth summer of the Pitzman Summer Nature Program, which begins June 18. The nature study programs offered in Pitzman include birds, trees (with leaf collections and identification), insects, projects on soils and gardening, and a general survey of the plant kingdom. For children who are interested in pursuing a research project, there will be Junior Research teams, and this year there will

Children at a spring Saturday program learning how to pot plants.

be special activities for children who have been in Pitzman before.

Pitzman classes are held outdoors at the Garden and meet four days of the week beginning Tuesday. Children enrolled in all of the classes meet at the Garden from 10 A. M. to 3 P. M. Those who stay all day may bring their lunches and purchase soft drinks at the Garden.

As in past years, there will be two five-week sessions of Pitzman. The program is open to children ages 7 to 16, and there is no fee. Registration begins June 3 and may be done in person at the Main Gate, or by telephone (TO 5-0440).

A second summer activity is the new vegetable garden project, which began in April. Lettuce, radishes and beets have already been planted, but there are still a few openings for children interested in learning how to grow their own vegetables. The Garden provides all tools, seeds, and other materials for good gardening. Children who have registered for this program meet at the Experimental Greenhouse each Saturday at 1 P. M. until school is out, then at 10 A. M. Wednesdays and Fridays during summer vacation. There is a $1.00 registration fee for participants in the vegetable garden program, and it is returned in the fall to the children who have stayed with the program to its completion.

Collecting insects is part of the summer Pitzman program.

In addition to the summer programs, the Garden offers Saturday morning activities for children throughout the year. These programs are free and require no registration. Programs start in the Museum at 10 and last until 11:30 each Saturday morning of the year. The schedule of Saturday activities until the end of June is as follows:

May 11—"Plants with Wet Feet." Demonstrations of aquatic plants. Children will go through the underwater tunnel in Climatron.

May 18—"Prehistoric Plants." The record and development of plants during the last 550 million years. Actual plant fossils are used.

May 25—"From Dust to Seed." How flowers are pollinated and fruits and seeds are developed. Emphasis is placed on insect pollinators.

June 1—"Bees and Flowers." Actual observations of bees seeking nectar in flowers with special markings (honey-guides).

June 8—"Tags for Trees." Children will make plaster casts of leaves.

June 15—"The Queen of Flowers." Children will sample rose family fruits in a study of the many different members of the Rose Family.

June 22 — "Tree Trail Nature Hunt." A treasure hunt in the wild part of the Garden for leaves and seeds. Prizes given for participation.

June 29—Nature Films. A selection of the newest and best color sound films.

Summer is a busy time at the Garden, and children who are enrolled in any of the Garden's programs are not likely to find themselves bored for lack of things to do. Best of all, they are not just busy; they are busy learning more about the world in which they live. For more information on any Garden program, call TO 5-0440.

FEATHER GERANIUM — JERUSALEM OAK

EDGAR ANDERSON

The curious aromatic plant known variously as "Ambrosia," "Feather Geranium," or "Jerusalem Oak" has recently been grown in several St. Louis gardens, and inquiries about it have come to the Garden from several sources. It is a species of Chenopodium, *C. botrys*, and as such is closely related to the common, weedy Lamb's Quarter or Smooth Pigweed. The entire plant is strongly (and most agreeably) aromatic. It has deeply lobed basal leaves, something like those of a geranium or an oak (hence the two common names) from which rise long panicles of small flowers followed by attractive small seed pods. It is now grown as a curiosity or for the use of its fragrance and dainty panicles in either fresh or dried flower arrangements.

Chenopodium botrys has had a long history of association with man. It was grown in medieval gardens for its fragrance and its supposed medicinal qualities. It was hung in bunches in the kitchen to sweeten the air or used like lavendar to give a fresh smell to bed linens. It is sometimes confused with the closely related vegetable, Good King Henry *(Chenopodium Bonus-Henricus)*, a lower and non-aromatic perennial with spinach-like leaves and dense flower clusters, which since the Middle Ages has been grown in European gardens for use, like spinach, as a pot herb.

Chenopodium botrys is native to the Near East and Africa and rather generally to central Eurasia. The name Jerusalem Oak may possibly refer to the plant's having been brought back by the Crusaders or other visitors to the Near East. Its original home is a little hard to determine since it has the capacity of sowing itself spontaneously in places to which it has been carried, though it never becomes weedy and troublesome. There are specimens in the Garden's herbarium which were collected in St. Louis a century ago, though so far as we know it has never become established here. Palmer and Steyermark in their *Flora* *of Missouri* list it as occasionally turning up in waste ground in St. Louis, Shannon, Ozark, Stone and Jackson counties. It has been collected at various places throughout the West including several remote mining camps, and it has become fairly common in parts of California.

It is one of those plants whose size varies a great deal with the fertility of the soil and the amount of water it has had. I have seen it coming up between the bricks in the pathways of an old New England garden near Worchester, Massachusetts, where in early summer it was only a few inches high. Its leaves there reminded me of a small oak-leaved geranium, and a pleasant aroma arose when they were stepped on. At the other extreme were the big plumes of seeding panicles used by Mrs. Mary Baer in the attractive Victorian arrangement of dried flowers displayed in the Tower Grove House, Henry Shaw's country home. These had been grown in the rich soil of an excellent garden in Ferguson; for that reason the branching panicles were well over two feet in length.

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FRIENDS OF THE GARDEN NOTES

NEW Friends officers were recently elected for the coming year. Harry E. Wuertenbaecher, Jr., was re-elected President of the Friends, with Mrs. Curtis Ford, Mrs. M. M. Jenks, Raoul Panteleoni, Mrs. C. Johnson Spink and Mrs. Tom K. Smith, Jr., as vice presidents.

The following new Friends of the Garden have joined since February 20, when the list for the March BULLETIN was prepared:

Dr. Walter E. Abell
Mr. and Mrs. William S. Beggs
Mr. A. Berry
Mr. and Mrs. Clarence W. Cherry
Miss Marion Lydia Clark
Miss Mary Frances Clifford
Mr. Philip Cotton, Jr.
Mr. and Mrs. Dana Cowell
Mr. Donald J. Day
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Mr. and Mrs. Donald H. Free
Mr. and Mrs. Thomas W. Graham
Mr. and Mrs. Walter S. Green
Mr. and Mrs. John C. Guhman
Mrs. Virginia Hay
Mr. and Mrs. Roger R. Jones
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Mr. and Mrs.
  S. Carson McCormack
Mrs. Mac H. Mandel
Mr. and Mrs. Michael P. Miklas
Mr. and Mrs. Paul D. Morgan
Mr. and Mrs. John J. Noble
Miss Carmelita O'Connor
Mr. Quintin Papineau, Jr.
Mr. and Mrs. R. W. Payne
Mr. and Mrs. Edward Prinz
Mrs. Taylor Schake
Miss Dorothy Schneider
Mr. and Mrs. W. W. Seat
Mr. and Mrs. Donald J. Sher
Mrs. Mathilda Siems
Mr. and Mrs. John Tremaine
Dorothea A. Vogel
Washington Heights Garden Club
Mrs. W. O. Wheeler
Mr. and Mrs. William E. Weise

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Mayor, City of St. Louis

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 9:00 P. M. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

June 1963
Volume LI
Number 6

COVER: American Pillar roses in bloom at the Garden on Memorial Day. These are small, brilliant pink flowers.

PHOTO BY BRIAN GORDON

CONTENTS

"Winter's Pleasant Ornaments
How to Identify Common Larvae
Book Review
Friends of the Garden Notes
Editor's Note

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: BRIAN GORDON.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden
Vol. LI No. 6 Bulletin June 1963

"WINTER'S PLEASANT ORNAMENTS" IN THE TOWER GROVE HOUSE

MARY E. BAER

"Winter's Pleasant Ornaments" are the blossoms of summer flowers dried when nature is at its prime. During the long gray days of winter they will enliven their surroundings with color and cheer. For the re-creation of the lost art of flower drying which the eighteenth century housewife knew so well, we should pay homage to Mrs. Louise Fisher. For twenty-three years she created "winter's pleasant ornaments," as she refers to them, for the rooms of the Restoration at Colonial Williamsburg. All of the flowers arranged by her hands expressed a living naturalness and a beauty of form always to be remembered. Her book *Eighteenth Century Garland* is out of print now, but if you are fortunate enough to own a copy, then you too can appreciate how humble the novice feels in the presence of the master.

Last winter it was my pleasure to bring the summer harvest into the lovely rooms of the Tower Grove House at Shaw's Garden. The Historical Committee have restored this beautiful old country place of the late Henry Shaw to its original 1850's elegance. The Victorian influence is present along with the early twentieth century England which Mr. Shaw brought to America.

With this these period styles in mind we allowed color to run rampant. Red, pink, yellow, orange and lavender in buxom arrangements were in keeping with the house and its furniture. Our containers for the dried blossoms were of fine antique porcelain, early stoneware, pewter and brass. A few of the arrangements are illustrated here, but black and white cannot capture the fresh appeal of the dried blossom.

The Supply of Dried Material

The best source of flower material is of course in your own garden. Many annuals, perennials, grasses, seed pods, herbs, trees, and shrubs will add to your collection.

Abundant bounty is yours for the picking along country roads, in woods and fields, and by streams. This bounty of the wild is twofold; your communion with nature will enhance the value and enjoyment of your handiwork. A field of Queen Anne's Lace in its pristine whiteness on a day in June is something that has to be experienced. Unless you are acquainted with the rich store of Missouri's wild flowers you would profit by the description and lavishly colored illustrations in *Wild Flowers*, by Homer House. The Public Library should have the 1961 revised edition. Mr. House stresses one admonition that bears repeating: "Care should be exercised not to injure the roots and leaves that are scarce and easily destroyed."

Flower shops are another source of supply. Leaves of eucalyptus, lemon and magnolia, ferns of all kinds and other exotic foliage can be dried or preserved in glycerin. The everlastings of strawflowers, Sea-lavender, Immortelles and Statice, Grains, Sea-oats, and yellow Yarrow, most of which are available in the fall, are also good to use.

The time to harvest is difficult to state exactly, but any time from spring until frost, when the material is at its peak, will do. For most blooming things the best time to harvest is when the buds are not too far open, since the drying process tends to force blooming. The best guide is of course experience and experimentation.

How to Prepare the Dried Material

Start with a very warm dry room, as dark as possible. Cellars are too moist, but an attic is perfect. (The colors of the blossoms will fade in the drying process if the blooms are ex-

An antique Wedgwood pitcher holds an arrangement predominating in rich Autumn colors of orange and yellow. Copper Beech leaves, Iris leaves, goldenrod, brown tone Hydrangea, brown dock, grasses, yellow Immortelles, and yellow and orange Strawflowers.

An eighteenth Century porcelain vase contining Saltbush, White Hydrangea, White Allium, white garlic seed heads, Queen Anne's Lace, and White Milfoil or yarrow. This is an all white arrangement.

posed to light; hence the dark room. Once the plants are dried the colors will not fade even in bright sunlight.) Store the blossoms in the drying room until time to arrange them.

Most wild flowers dry best when tied in small bunches and hung on wire or twine which has been suspended from wall to wall. They should be tied with the heads down to preserve their natural state. The stems will thus be dried straight and firm. Other plants such as goldenrod, yarrow, boneset dock or similar plants dry best upright in large-mouth jars, cartons, or peach baskets. Grasses dry best in this way also, as does any plant which requires a graceful curve to its stem. Queen Anne's Lace, Black-eyed Susans and sunflowers should be dried by placing the blossom head up, stem down in a wire mesh (chicken wire or hardware cloth is good) laid over the top of a cardboard box. In this way, shrinkage of the blossom is prevented.

Most annuals and perennials dry best in fine white sand. It is used for a children's sandbox and can be purchased at a department store in fifty-pound bags for a nominal sum. Borax, cornmeal and silica are other useful drying agents. My personal preference is white sand, which I have been using for over 20 years.

The sand must be dry. Take a shallow cardboard box and put a generous layer of sand on the bottom. If you are going to dry a flower like a zinnia, hold the stems in your left hand, flower head down on the sand, and with your right hand slowly dribble more sand under and around the blossom until it is completely—though lightly—covered. Sometimes a little hill of sand is best for certain blossoms.

For delphinium a trench works best because each blossom has to have the sand dribbled under and over it separately. Stems will generally become anchored along with the blossom as it becomes covered with sand. If not, then stand your box next to a support and tilt the stem toward it.

The sand method of drying is a painstaking, arduous one, and requires patience for good results. Zinnias, Bachelor Buttons, Delphinium—even some roses—come out of the sand drying process in full color and form.

An early stoneware crock filled with seedpods, grains, brown dock, okra pods, grasses, red Sumac, Artichokes, and brown oak leaves.

There is an if, however. The form and color will remain true if the blooms are not exposed to drafts and moisture in the atmosphere after they are arranged. I have had this happen so many times to blossoms that now I dry practically everything by using the upright, or hanging method. There is so much humidity in our atmosphere that blossoms often shrivel up and wilt unless carefully dried. Whatever process you use, be sure to strip all leaves that are not needed and any unsightly bloom, before proceeding to dry the flowers.

Branches of trees and shrubs are best preserved in glycerin. One part glycerin to two parts warm water is the proper mixture to use. The stems to be preserved should be immersed in six to eight inches of solution, or even a little more. The stems should never be longer than 18 inches, otherwise they become too long for proper absorption to take place. Pound the bottom three to four inches of the stem with a hammer to aid in the process. Several cuts in the bark will aid further. Wipe each leaf free of dust and remove all other unsightly ones. For best results use about four branches to a jar.

The time you should leave the branches in the solution depends on your material. *Magnolia grandiflora* requires the longest time, about four weeks.

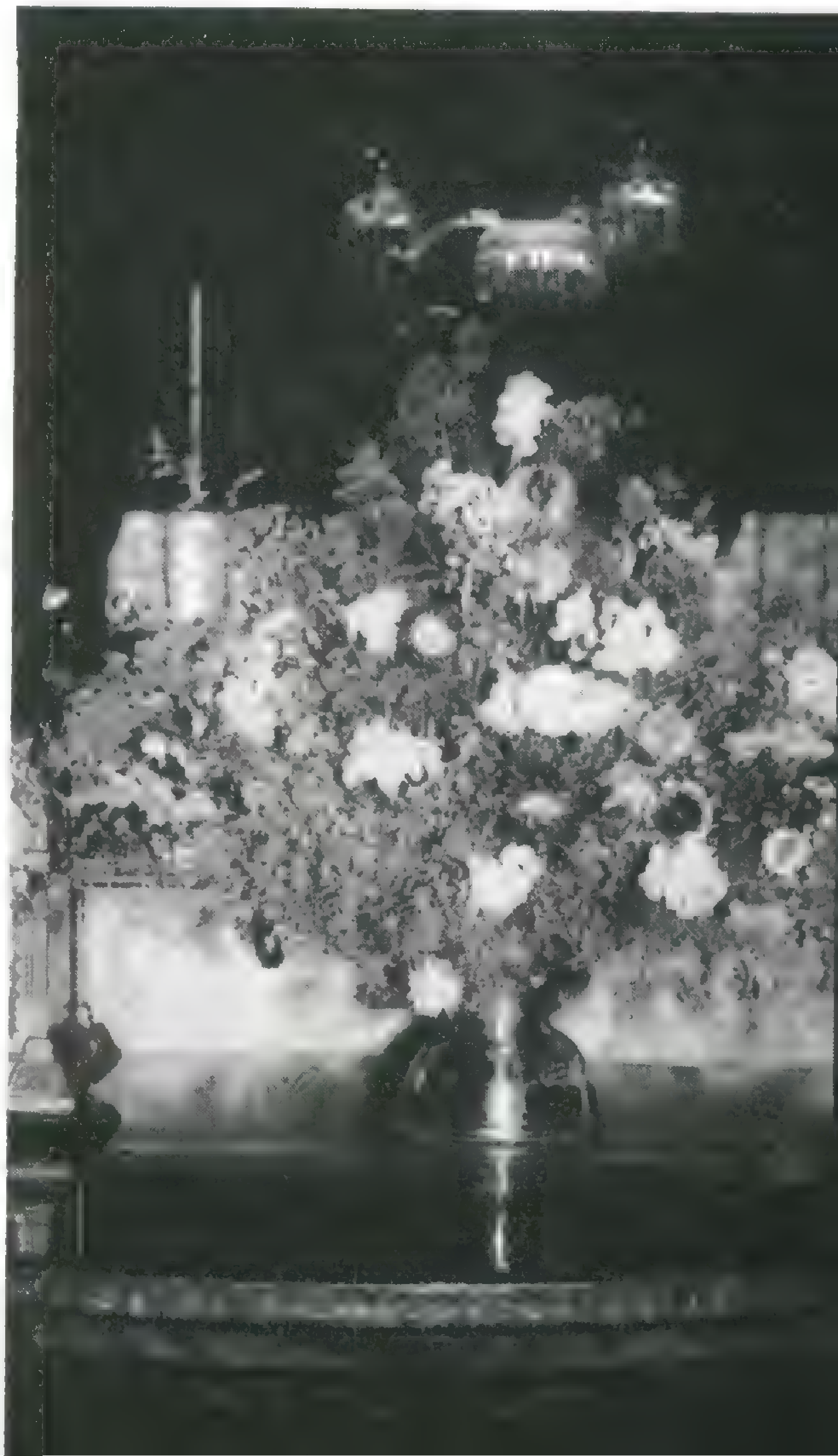
Copper Beech leaves, purple Plum, alba Poplar and others preserve with great success. Ferns and flat leaves will press beautifully. To press these leaves, take thick newspaper and lay your material on top. Do not allow the leaves to overlap. Cover the leaves with another layer of newspaper and continue adding leaves, layer by layer in the same manner. When you are finished, put a weight on top. The weight must be left on until the material is completely dry.

To give ferns a lustre and to aid in their preservation, paint them before pressing with a little cooking oil. A soft water color brush is good for this step.

MAKING AN ARRANGEMENT

Making an arrangement of dried plant material is similar in many re-

A brass container with a light airy arrangement of Ambrosia (feather geranium), gray Silver King Artemisia, Sea Lavender, pink Allium, purple Statice, pink, yellow, orange Strawflowers, yellow Immortelles, and Miniature spikes of pink Cockscomb.



spects to making one of fresh material. The arrangement must harmonize with its surroundings in color, balance, and design. It takes much more of the dried material to make an arrangement, and greater care must be exercised in its handling.

Fill your container to within several inches of the top with the same fine white sand used in the original drying process. Moisten it so that it is just damp. This dampening makes it easier to work with and when it dries, it holds the stems more firmly. Now you are ready to take the container to the plants in the drying room.

For a mass arrangement fill in the background of your container with outline material. For a sturdy type of arrangement, large fern leaves, goldenrod, or saltbush are good. For a light airy effect, use Sea-Lavender, Artemisia, Ambrosia or any other graceful material. Start filling in with your blossoms, working from the top with the light colors to the bottom with the dark blossoms. Goldenrod, Saltbush or Hydrangea are all excellent for fillers.

PLANTS TO USE FOR DRIED ARRANGEMENTS

The following plants dry well, but the list is not complete. I am giving only the ones I have had success with. For a more complete list see one of the books on dried material. Plants which can be dried by hanging are followed by an H; those which should be dried upright are followed by a U.

Annuals

Celosia—Cockscomb: Crested and plumed, in crimson, red and yellow .... H

Baby's-breath *(Gypsophilia)* white or pink .... H

Bachelor-Button or Cornflower *(Centaurea cyanus)* Blue, red, white H

Globe-Amaranth *(Gomphrena globosa)* Clover-like blossoms which dry like an everlasting. Purple, pink, white, lavender .... H

Grasses, ornamental .... H

Job's Tears *(Coix lacryma-jobi)* Foliage-like ornamental grass .... H

Honesty *(Lunaria biennis)* or money plant, flat silver seed pods ...... H

Larkspur *(Delphinium)* White, pink, blue, lavender .... H or U

Salvia *(Farinacea)* or Mealy Cap Sage. A true blue flower, excellent for drying. H—for straight stem. Very graceful if U.

Strawflower *(Helichrysum monostrosum)* Pink, rose, salmon, white. Pick before flower opens .... H

Sunflower *(Helianthus)* Golden yellow —six inches across .... H

Perennials

Artemisia: silver king. Feathery gray spikes .... H or U

Chinese Lantern *(Physalis franchetii)* Lantern shaped orange-red fruits H

Delphinium: Blue .... H

Dusty Miller *(Cineraria maritima)* Silver gray foliage .... H or U

Globe Thistle *(Echinops rito)* Large globes of blue flowers. Can be picked when the globes are green, or immediately as they turn blue. Otherwise they tend to shatter. .... H or U

Grasses: Ornamental .... H or U

Lambs Ears *(Stachys lanata)* For silver gray foliage .... H or U

Lavender *(Lavandula)* For flower spikes .... H

Onions ornamental *(Alium)* Pale pink, blue, white or violet .... U

Poppy Oriental *(Papaver orientale)* Pick the seed pods when dry U

Sea Lavender or Statice *(Limonium)* A delicate lacy, many branched plant .... U

Yarrow *(Achillea)* Clusters of yellow, white or rose pink .... U

TREES, SHRUBS

Bamboo *(Polygonum cuspidatum)* For line arrangements. Cut in fall. H or U

Beauty-Bush *(Kolkwitzia amabilis)* Pink cascade of blossoms in June. Seed pods later H or U

Beech *(Fagus sylvatica)* Tree, glycerin or press methods. Can be used for years by freshening up each season.

Dogwood *(Cornus)* Tree. Glycerin or pressed—green in summer or as they turn red in fall.

Hydrangea *(H. domotoi)* Large globe shaped clusters of flowers, white in early summer, turning pink around September. Sometimes beige or brown .... U

Magnolia *(M. grandiflora)* Glycerin method.

Okra. Pick the seeds which have turned into striped beige and brown in fall.

BOUNTY OF THE WILD

Boneset *(Eupatorium perfoliatum)* Flat clusters of small white flowers. Pick before buds open. Dries a lovely green in June .... U

Cattail *(Typha latifolia)* Pick when pencil size in June. Then they will not shatter. They grow in marshy and swampy ground .... U

Dock *(Rumex)* Long spikes are green in June, rosy beige in summer and chocolate-brown in fall .... U

Ferns: All kinds .... Press

Goldenrod *(Solidago)* All varieties from the earliest in July till frost in the fall. Pick in bud stage. Opens into bloom when drying. If picked when the bloom is too far gone it is apt to shatter.............................. U
Pick quantities of Goldenrod—the stems are useful too for blossoms that have stems too frail to hold them.

Heather: Rose or lavender H or U

Joe-Pye-Weed *(Eupatorium purpureum)* Pick before clusters of buds open in order for it to retain the rosy-purple hue. .... U

Milkweed *(Asclepias syriaca)* Dry the spikes with the pods on, remove all leaves, open the pods and remove the silky seeds. The open pods will dry a pale yellow inside, if exposed.

Mullein *(Verbascum thapsus)* Pick the velvety gray green leaves early when they are in rosettes. Then later pick the tall spikes when they are green; late summer, tan; fall, brown. .... U

Pearly Everlasting *(Anaphalis margaritacea)* Produces clusters of tiny white blossoms on gray green stems.

They grow wild in the woods, but I have only seen them on the moors in Nantucket.

Queen Anne's Lace or Wild Carrot *(Dancus carota)* The fields are white with their large lacy flower heads in late June. Cut some of the curled green flower buds too. U

Sumac *(Rhus)* Pick green early in summer or red in fall U

Teasel *(Dipsacus fullonum)* Prickly cone shaped heads U

Thistle Canada *(Cirsium arvense)* Small lavender flowers.

Bull Thistle *(C. lanceolatum)* Large lavender flowers.

They both bloom much of the summer; they dry beautifully with their leaves intact. Wear gloves to pick them. H or U

Grains of millet, rye, wheat, oats and barley. Green or dried in the fields.

There are scores of others for your experimentation, just as there are different materials for use in drying. The best way to learn about them is to try drying them yourself.

RECOMMENDED REFERENCE BOOKS FOR FURTHER STUDY

"New Ways with Dried Flowers"
By Ruth Gannon
The Crowell Co. 1958
"The Flower World of Williamsburg"
By Joan Parry Dutton
Colonial Williamsburg, Williamsburg, Va. 1962
"Wild Flowers"
Homer House
Macmillan 1961 (Revised)

HOW TO IDENTIFY COMMON LARVAE

CHRISTOPHER CHOWINS

FIRST let it be made clear exactly what a larva is. The larva is the immature stage in the life cycle of a true insect *(Hexapoda)*, a six-legged creature whose body in the mature stage is divided into three segments—head, thorax, and abdomen. These true insects have a complete life cycle or metamorphosis of egg to larval to pupal to adult stages.

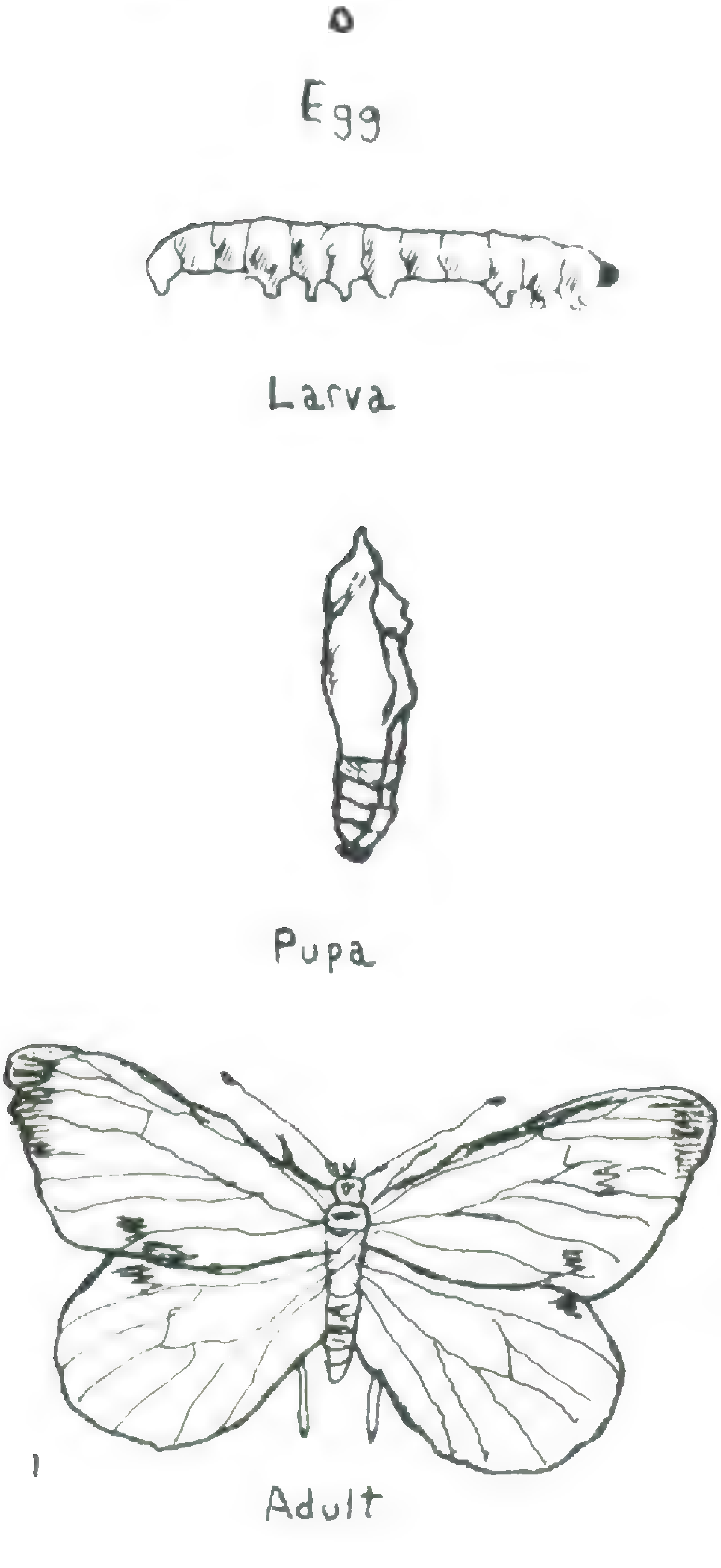
It is the larval stage of the life cycle which we are most likely to see and which involves damage to our garden plants. Insect eggs are usually too small to be seen and the pupal stage is also difficult to find, while the adult stage, though visible enough, is often winged and therefore passes unnoticed as far as gardeners are concerned.

Larvae are known by a number of vastly misleading terms; e.g., bugs, worms and maggots. What will be described here are the true larvae, representing a definite stage in a definite class of the insect world.

Identification of any stages in the life cycle of an insect will tell us what sort of mature adult insect has laid the eggs, and possibly how many broods or families are produced annually. In many cases, once the family of an insect is known, we will then know perhaps where the resting or pupal stage is spent, and perhaps where the eggs may be laid. With this knowledge, the control measures necessary to kill harmful garden pests can be greatly facilitated.

The caterpillar: This is the term given to the immature or larval stage of the Lepidoptera, the order of butterflies and moths. The caterpillar is characterized by a well defined head, biting mouthparts, 3 pairs of thoracic legs and 5 pairs of abdominal legs. Another type of larva or caterpillar often seen in this order is the *Geometridae*; these are sometimes called inchworms or earth measurers.

Diagram 1. Cabbage butterfly *(Pieris rapae)*



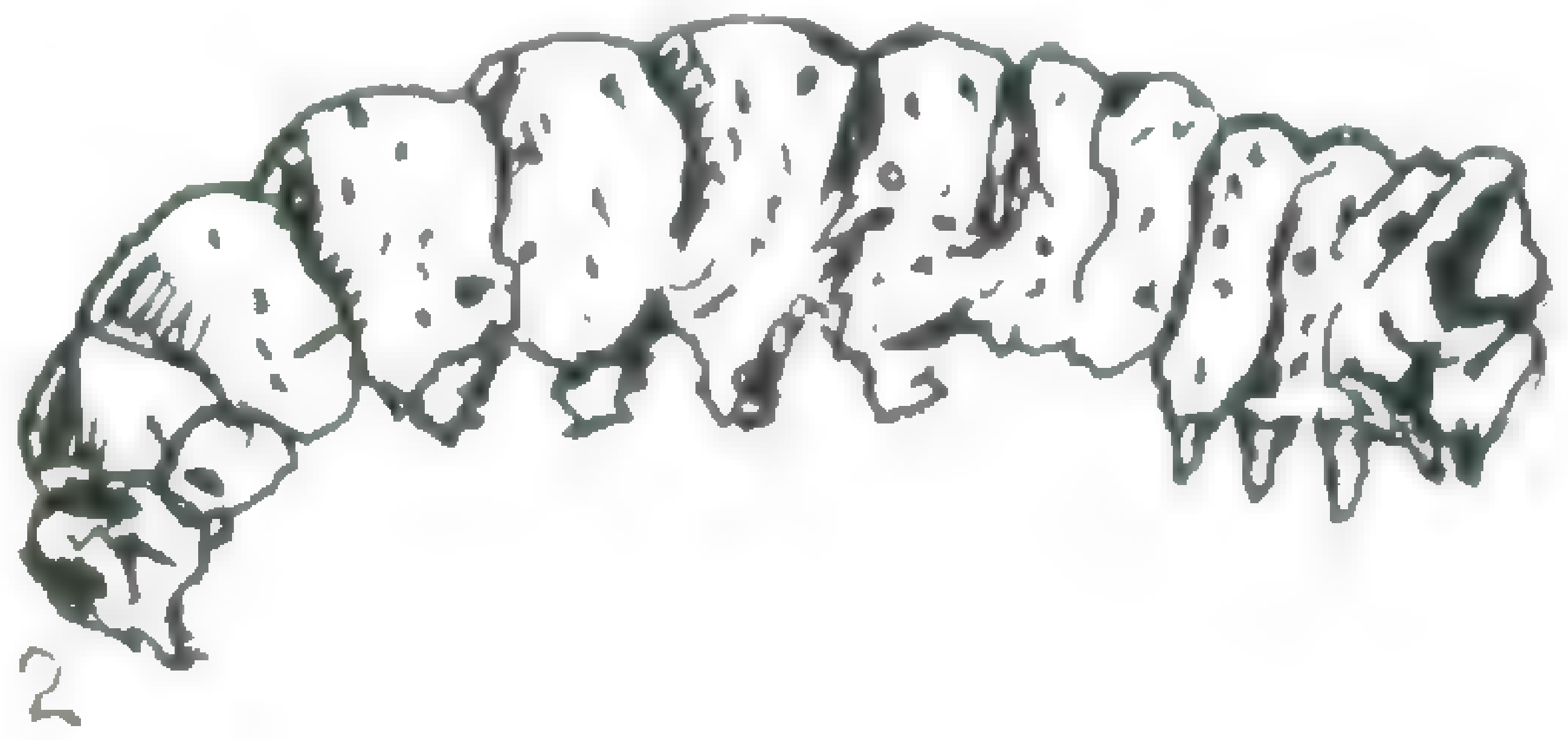
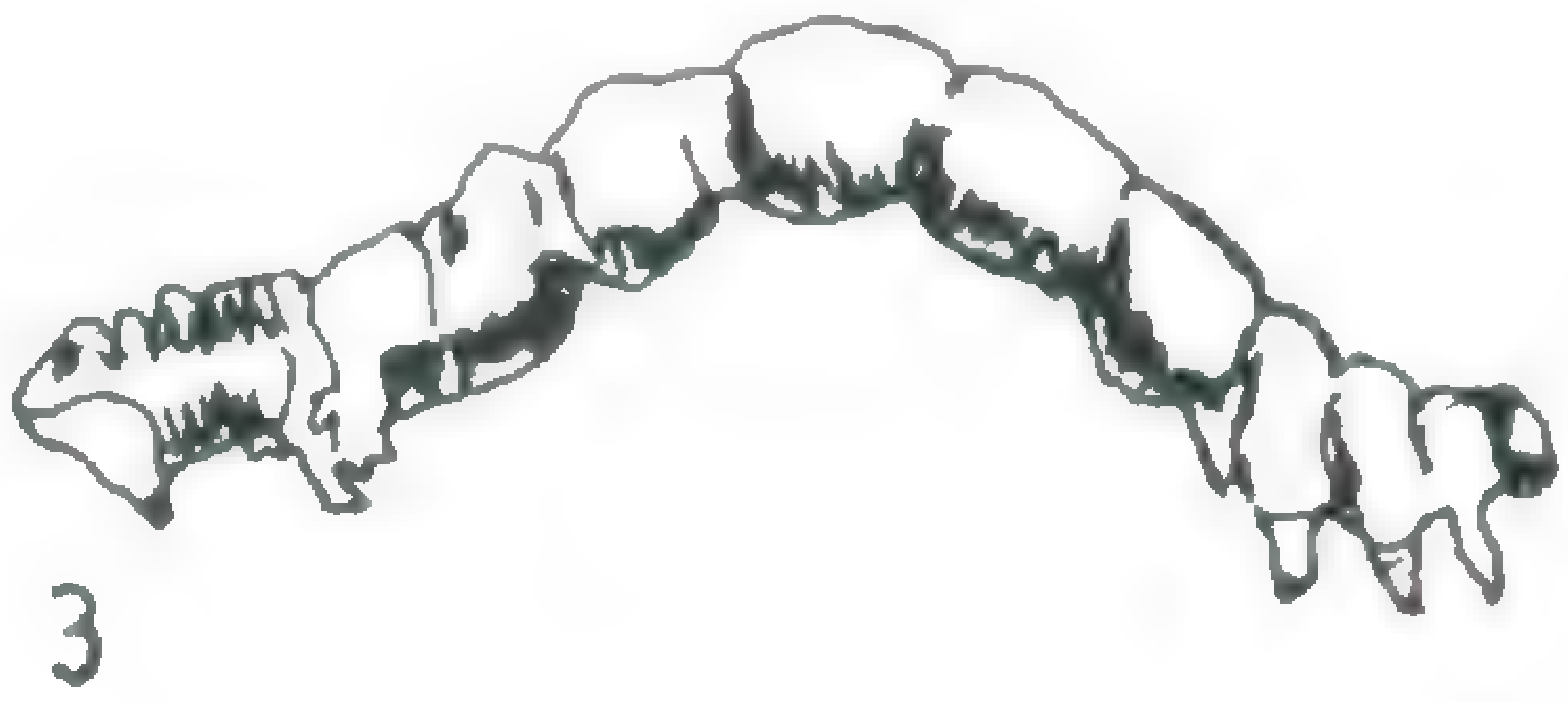


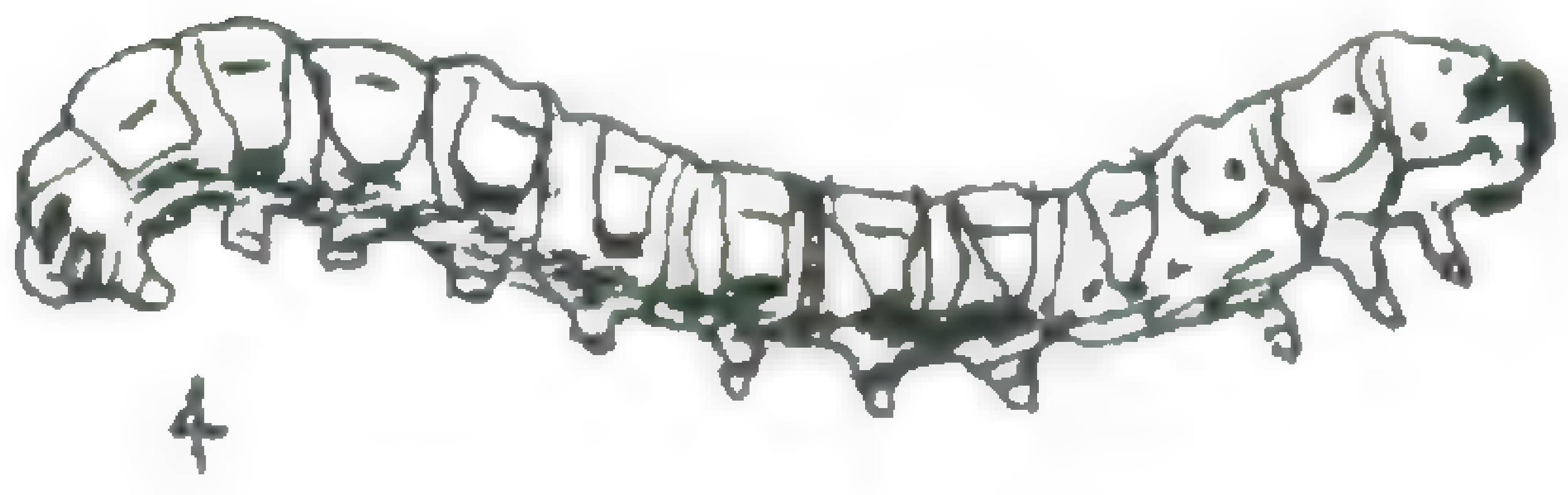
Diagram 2. Corn earworm *(Heliothis umbrosus)*

Fall canker worm *(Alsophila pometaria)* (Diagram 3). It is characterized by a well defined head, biting mouth parts, 3 pairs of thoracic legs and 2 pairs of abdominal legs.



Sawfly larva: This is often mistakenly identified as a caterpillar; i.e., of the order *Lepidoptera,* but this larva actually belongs to the same family as bees and wasps, the *Hymenoptera.*

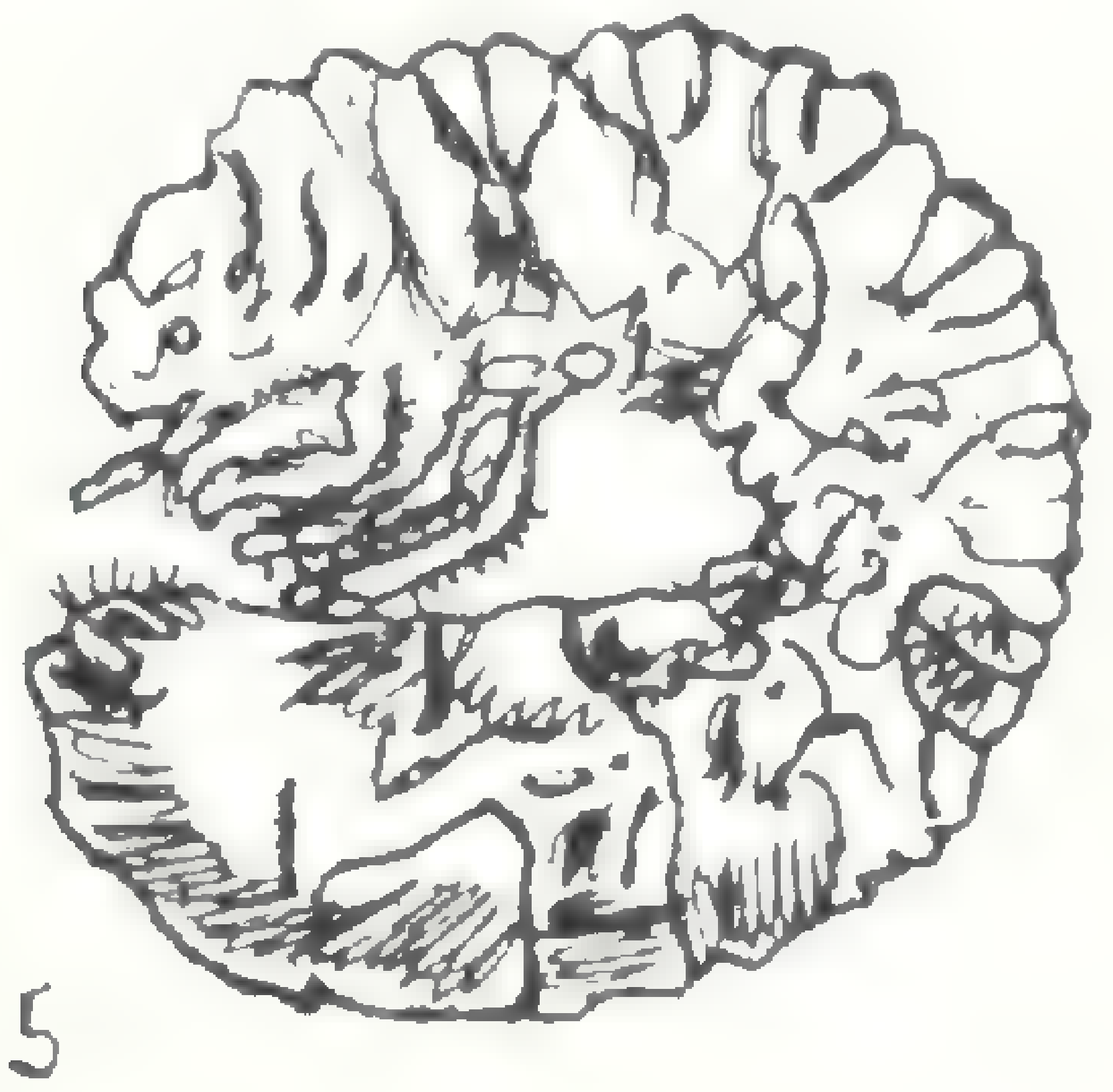
Apple sawfly *(Holocampa testudinea)* (Diagram 4). The sawfly is recognized by its well defined head, biting mouthparts, 3 pairs of thoracic legs and 6, 7, or 8 pairs of abdominal legs. (Larvae of bees and wasps have



merely a vestigial head and no legs at all.)

Larvae of the beetle order *(Coleoptera)*:

Potato beetle *(Leptinotarsa decemlineata)* (Diagram 5). It is characterized by: Prominent head, biting mouthparts, 3 pairs of thoracic legs and no abdominal legs. The weevil family is found in this order, *Cucurlionidae*, and is characterized in the same way.



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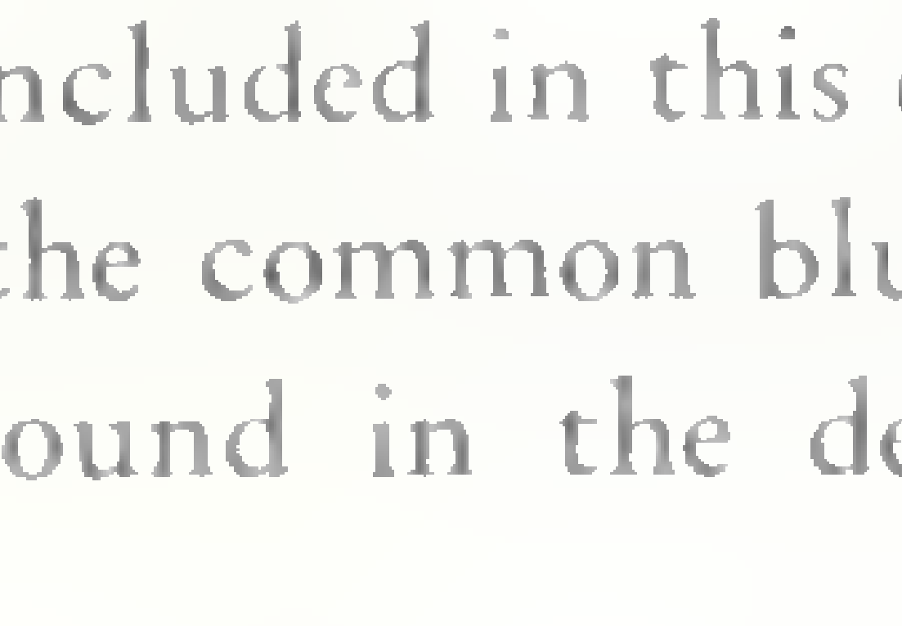
Plum curculio *(Conotrachelus nenuphar)* (Diagram 6).

The fly order *(Diptera)*:

This is a large order, containing many harmful pests of plants and animals. Included in this order are the *Muscidae*, the common bluebottle flies. Maggots, found in the dead carcasses of animals and in rotting food, are larvae of flies.



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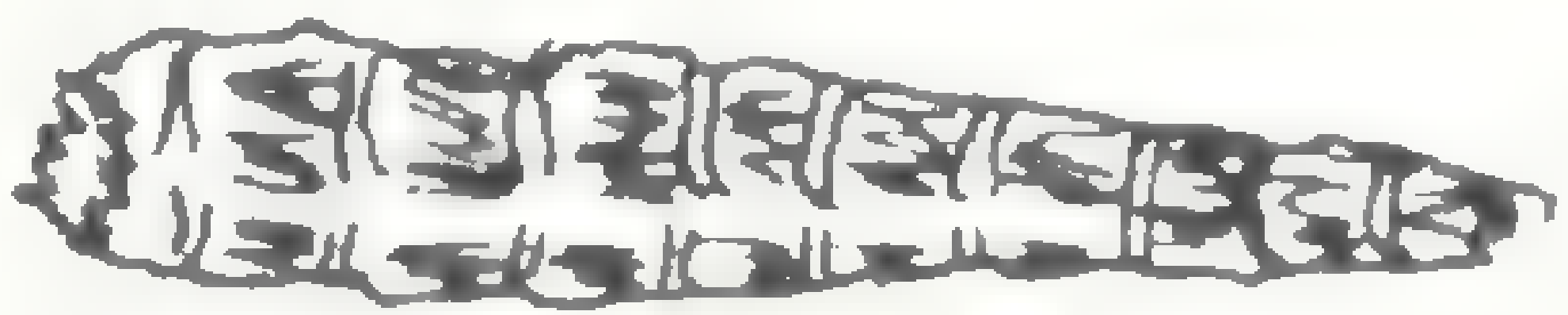
Common housefly *(Musca domestica)* (Diagram 7). Characteristics: Biting mouthparts, no thoracic legs and no abdominal legs. The head is vestigial; i.e., not defined.



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There are two main ways by which an insect feeds. One way is by biting and digesting its food; insects which eat plant foliage are of this type. To control chemically this type of insect pest, a stomach poison such as lead arsenate may be applied to cover all the foliage of a susceptible plant. A contact insecticide such as nicotine sulphate, which will enter the breathing pores of the insect and cause asphyxiation, may also be used with success.

The other main type of feeding is by sucking. The insect of this type sucks the cell sap of the plant into its own system by means of a pair of tubes called stylets. This type of insect cannot be controlled by stomach poisons, so a contact spray must be used. There are insecticides which act both as contact and stomach poisons; DDT is a popular example of such a spray poison.

* * *

BOOK REVIEW

Michael Haworth-Booth F.L.S. ***The Moutan or Tree Peony.*** pp. 106 + 11 photographic plates. St. Martin's Press, N. Y. 1963. $3.95.

This short and highly readable account of the tree peonies has quite a different tone from many English books on horticultural subjects. The author is an English landscape gardener and nurseryman, but he has traveled in the United States and is familiar with American work on the subject. He dedicates his book to Miss Silvia Saunders of Clinton, N. Y., who is carrying on the work started by her father, Professor A. P. Saunders of Hamilton College, and the American Peony Society. Of the 35 references in the bibliography, 40% are from American sources, including one under the joint authorship of Dr. John C. Wister of Swarthmore College and Harold Wolfe of St. Louis.

Tree peonies, low shrubs with graceful leaves and flowers up to the size of cabbages, trace back to four rare Asiatic species. One of these was domesticated so early that its origin was already being discussed by a Chinese author in 536 A. D. It reached Japan as early as 734 A. D. and both Chinese and Japanese varieties have traveled in quantity to Europe and America since the great Sir Joseph Banks began the importation by successfully establishing a double magenta variety at Kew in 1789. The rare wild species from which these cultivated kinds had been developed were not found until much later. Reginald Farrer, the rock gardener and plant explorer, has given a dramatic account of his discovery of the wild white variety of *Paeonia suffruticosa* on his trip to the Tibetan border in 1914.

"Through the foaming shallows of the copse I plunged, and soon was holding my breath with growing excitement as I neared my goal, and it became more and more certain that I was setting eyes on *Paeonia moutan* as a wild plant. The event itself justified enthusiasm, but all considerations of botanical geography vanish from one's mind in the first contemplation of that amazing flower, the most overpoweringly superb of hardy shrubs. Here in the brushwood it grew up tall and slender and straight, in two or three unbranching shoots, each of which carried at the top elegantly balancing, that single enormous blossom, waved and crimped into the boldest grace of line, of absolute pure white, with featherings of deepest maroon radiating at the base of the petals from the boss of golden fluff at the flower's heart. Above the sere and thorny scrub the snowy beauties poise and hover, and the breath of them went out upon the twilight as sweet as any rose. For a long time I remained in worship, and returned downwards at last in the dusk in high contentment."[1]

Farrer collected no seeds or living plants, and it was not until Dr. J. F. Rock found transplanted plants growing in a lamasery garden and seeds were widely distributed by the Arnold Arboretum of Harvard University that this plant became known to western collectors.

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[1] In "On the Eaves of the World," 1926, beginning on page 110.

Haworth-Booth has chapters on the species of Tree Peony, a check list of garden varieties in England, on the landscape uses of the Moutan as a garden shrub, and on propagation and culture (including pests and diseases). There is a bibliography of 40 titles, but no index.

Edgar Anderson

* * *

FRIENDS OF THE GARDEN NOTES

Last month the St. Louis Chapter of the League of Women Voters held a contest in which St. Louisans were asked to rank the top ten assets of St. Louis. It is most gratifying to us that out of the almost 600 contestants, Shaw's Garden received the largest number of votes. Not only the Garden staff are pleased that their efforts to make the Garden as good as possible are being so well recognized, but it must also be a satisfaction to every Friend of the Garden that, through his membership, he is contributing to the upkeep and effectiveness of the Garden.

In this connection it is appropriate to clarify a misunderstanding which has come up as a result of the establishment of the new Greater St. Louis Arts Council, of which the Garden is a member. Many Friends have called in to ask whether they should continue to contribute to the Garden through the Friends of the Garden, and others have simply returned their membership reminders with the note that they had contributed to the Arts Council as a means of helping the Garden. The impression among many Friends has been that it is no longer necessary to contribute to the Friends of the Garden.

Quite the opposite is true. Contributions directly to the Friends of the Garden are always necessary if the Garden is to maintain itself and grow. Henry Hitchcock, President of the Board of Trustees, recently sent a letter to members of the Friends in which he explained the relationship between the Garden and the new Arts Council. For the benefit of Friends who did not see the letter, the following paragraphs are reprinted here:

"At our hearing before the Budget Committee of the Greater St. Louis Arts Council, its members emphasized the importance of the continuance and expansion of the Friends of the Garden. They urged us both to enlarge our membership and to strengthen it. As you know, the Council finances deficits only, and the deficit we presented in our budget was predicated on even greater support from our Friends than in the past.

"Please assist your Officers in every way possible and encourage them with your continued support. Your financial aid to the Garden has been of tremendous help in making it the joy it is to the thousands who visit it every year.

"Many, many thanks for your interest."

NEW MEMBERS OF FRIENDS OF THE GARDEN

April 19 through May 20

Mrs. Donald S. Babcock
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Mrs. Ben Phillips Donnell
Mrs. J. P. Frein
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Mrs. J. G. Taylor Spink
Mr. and Mrs. L. J. Vogler

NAME OMITTED FROM THE ROSTER OF THE MARCH BULLETIN

Mrs. George H. Pring

EDITOR'S NOTE

RANLET LINCOLN, assistant to the Director at the Garden since 1960, resigned from the Garden staff June 1 and has accepted an appointment as assistant to Francis V. Lloyd, Jr., newly appointed Director of Pre-Collegiate Education at the University of Chicago. Lloyd is currently Superintendent of the Clayton Public Schools and Lincoln was a member of the Clayton School Board until April of this year.

Both Lloyd and Lincoln will assume their new duties in Chicago on July 1. Lincoln also expects to pursue graduate studies at the University's Graduate School of Education. In addition, he will serve as editorial consultant for Science Research Associates, Inc., Chicago publishers of curriculum materials.

Before coming to the Garden, Lincoln was vice president of the Lemoine Skinner, Jr., public relations agency of St. Louis. He came to St. Louis in 1954 as director of public affairs at KETC, Channel 9.

He was graduated in 1950 from St. John's College, Annapolis, Maryland. From 1957 to 1960 he served on the board of the Department of Christian Education of the Episcopal Diocese of Missouri.

* * *

This issue is the last BULLETIN until September. At that time the Editor's duties will be assumed by Dr. Edgar Anderson, Curator of Useful Plants at the Garden and a frequent contributor to these pages. The present editor will enter the Graduate School of the University of Missouri in September to continue study of American history and journalism.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 9:00 P. M. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

September 1963
Volume LI
Number 7

COVER: Looking directly into one of the Passion-flowers *(Passiflora quadrangularis)* in the Climatron. Several of the supposed symbols of Christ's Passion show up well in this Photograph. Radiating from the center of the flower are the three white stigmas which represent the three nails in the cross. Peeking out behind them are the five stamens (for the five wounds). The long filaments of the corona dominate the flower and typify the halo. Beyond it can be seen the ten perianth parts (five petals and five sepals) which were thought to represent the ten disciples present at the crucifixion. Further details in the text.

PHOTO COURTESY OF THE ST. LOUIS POST-DISPATCH

CONTENTS

Passion-flowers at the Garden
The Band Concert for Friends of the Garden
Our Worst Weed Becomes a Triple Problem
The Chinese Parasol-tree in 1963
Moth-Mullein in a Suburban Lawn
We Answer the Visitors
Friends of the Garden Picnic
The New Snack Bar
Saturday Morning Programs
Coming Flower Shows
Life Memberships
New Members of the Friends of the Garden

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden
Vol. LI No. 7 Bulletin September 1963

PASSION-FLOWERS AT THE GARDEN

LIKE many other tropical plants, passion-flowers have grown superlatively well in the Climatron, flowering abundantly and over long periods. They have the reputation of not setting fruit under greenhouse conditions, but one of them, *Passiflora quadrangularis,* the granadilla, has set fruit freely for months. Many of these suffered from the curiosity of visitors and the immature fruits, like small green plums, have turned up here and there along the walks in various parts of the Garden. Enough survived, however, to make a continuous display. They quickly swelled up into smooth light-green melons nearly a foot long, gradually brightening to a brassy green-gold as they ripened.

Passifloras are a feature of the American tropics and sub-tropics. Some 400 species of them are native there, only two reaching the temperate zone. A very few species hail from the Orient but Passifloras are easy to grow from cuttings or from seeds and the best of the American fruits and those most effective as flowering vines are widely cultivated around the world.

A few species are shrubs, most of them are climbers with attractively coiling tendrils which have the look of precision-made springs. Until they blossom, many Passifloras do not look greatly unlike squash or cucumber vines, except that the foliage, the tendrils, and the vine itself have a neater and more permanent look, as if they had been made out of better materials and more care had been taken in putting them together.

The flowers are distinctive. They are enough different from other kinds of flowers to be intriguing to anyone who has previously looked carefully at a flower of any other sort, be he a professional botanist, an artist, a gardener, or an amateur naturalist. They are usually dominated by a fleshy outgrowth, technically a crown or corona, which may be variously cut and divided. Frequently, as in the four species which have been flowering in the Climatron, the most conspicuous part of the crown is a radiating cluster of several dozen long graceful filaments which may be variously curved, colored and patterned depending upon the species and variety of passion-flower. These filaments emerge above the petals and sepals and may extend beyond them.

A further air of complexity is given these beautiful flowers by the fact that the remainder of the flower parts, the stamens and the pistil, are carried by a special stalk which rises from the center of the blossom.

Given this fundamental pattern it is interesting to see how widely it varies in color and size and proportion from one species to another. The filaments of the crown may be white or banded or even speckled. The sepals and the petals may be of the same or different colors or the flower may be without petals. The chief color of the flower may be yellow, green, blue, or red. The red itself may be pink or rose or terra-cotta colored or a brilliant scarlet. The flower may be an intricate pattern of two or more colors in various shades, or it may be one shade of one color throughout. The blossom may be flat, more or less like a large-flowered clematis, or it may be drawn out at the base into a long narrow tube.

The fragrances of the flowers are also varied. In those which have bloomed in the Climatron there seem to be two fundamental variables, a sweet flower-like fragrance and a musky, animal odor. The four kinds which bloomed struck different balances of these basic two. *Passiflora alata* had the most intriguing of the mixtures, varying somewhat with the time of day and greatly with the reaction of the person who did the smelling. Some thought it was a strong odor; others could scarcely detect it. To a very few it was attractive, just musky enough to be interesting. To many it was a disagreeable combination of odors, to some downright disgusting and most unpleasant.

If the passion-flowers intrigue us now with their beauty and their strange shapes, imagine their effect upon the early Spanish and Italian naturalists who came upon them in Latin America. In those days much more of magic was bound up with medicine. Students of plants believed that by examining a plant carefully you could determine its significance and even learn in just what way it might be used in healing. The symbolism of newly discovered plants was of serious concern. In such an atmosphere it was not long before tales began to circulate (and in circulation were enlarged upon) of miraculous vines whose flowers were a record of Christ's suffering (His "passion") on the way to the cross.

Hence the flowers were "passion-flowers" and are still universally known by that name, though in later years the advertising for one of the drinks which is made from the fruits, hints at other meanings of the word "passion."

Details of the interpretation of the flower varied between one account and another, as they might well have to, there being such variation between different species and varieties of passion-flower. The following account will serve for the accompanying pictures of *Passiflora quadrangularis* and can be adapted to other species.

The outer conspicuous parts of the corona represent the radiating glory which streamed from Christ's head; one of the lower cycles deeper within the flower is the crown of thorns. The three big stigmas at the very apex of the flower are the three nails in the cross; the five strange sidewise stamens just below them are the five wounds of Christ. In this species the five sepals and the five petals which alternate with them look practically the same, seen from above when the flower is open. The ten of them represent the ten disciples who were present at the crucifixion, Peter and Judas being absent. The tendrils closest to the flower, being in the rapidly developing part of the plant, are frequently uncoiled and their long menacing branches are taken to represent the whips with which Christ was scourged.

The most widely grown of the edible passion-flowers, *Passiflora quadrangularis*; the granadilla (pronounced granah-deeyah in Spanish), is the one which has made itself most rampantly at home in the Climatron. From the lower ground level it quickly grew up to the gallery walk where it spread out sideways along the railing and on up towards the roof when further support was offered it. Though it is the coarsest of the four passion-flowers we have been growing, it is a fine looking vine. As the name "*quadrangularis*" implies, it has four flanges coming out stiffly at right angles from the stem and extending from one leaf to the next, frequently so well-developed as to form a green web or wing. The leaves are unlobed, as large as your hand or larger, heart-shaped at the base and narrowed at the tip to a sharp point.

The flowers were produced abundantly over a period of some months, some of the branches of the vine almost flowering themselves to death at times. In addition to major periods of bloom there were marked cycles from day to day. After several days of only one blossom, or none, or perhaps two or three, there would be a day with twenty or more all in bloom at once, to be followed by another period of scarcity. These cycles were the more noticeable because like all the passion-flowers known to me, each blossom stayed in bloom for only a day and with this species not even a full day. It sort of half way opened up in the morning, showing the beautiful purple and white filaments of the corona practically wadded within the bright green sepals, for in *P. quadrangularis* the corona has the air of being too large for the flower which bears it. The flower would reluctantly crack open a little wider, give off its scent and attract insects and then start to wither and close up again.

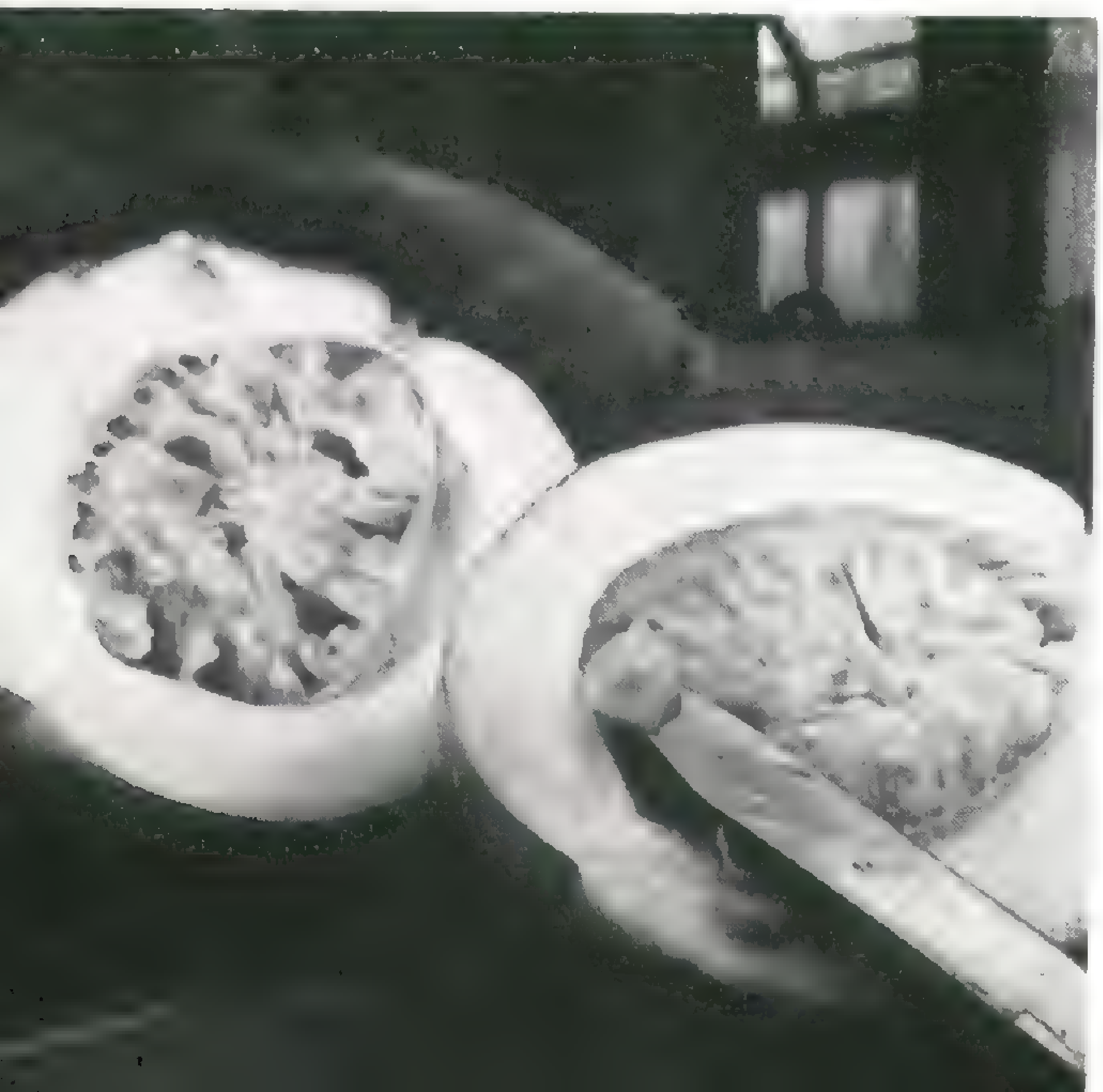
The fruits set freely, grew to the size of muskmelons, much larger than those of most other species, then slowly turned from green to gold and when you shook them you could hear the large hard seeds sloshing around in the semi-liquid pulp. At this point they are just right to use. With modern equipment it is simple to prepare them for the table or for serving from a tray. Open one into a large basin, straining off the big hard seeds with a colander or coarse sieve. Scoop out all the soft and semi-liquid pulp as well as the juice. Add ice cubes and just a touch of sugar and whip it all up in an electric blender until everything, ice cubes, flesh, and juice, are one homogeneous whole. Pour into glasses and sip it as slowly as possible through a straw. Served in this way, it is an effective remedy for the discomforts of hot weather and will be relished even by those who found the *granadilla* too insipid when tried in other ways. If you wish you may put additional flavorings in the blender, alcoholic and otherwise, but the *granadilla* pulp and ice beaten together produce a smooth, fragrant, faintly gelatinous perfection of which one becomes increasingly fond, which is hard to improve upon for hot weather sipping.

Its size, its productiveness, its beauty and interest as a vine, have made the *granadilla* a favorite in tropical Latin America and it is widely grown under a variety of names, while its own name gets more or less bandied about for the other cultivated species. In Costa Rica it becomes the *granadilla real* (which is to say "royal"), in the French Islands it is the *barbadine*, in Cuba *pasionaria*. In Brazil one of its names is *maracuyá melão*. In Colombia it is *badea*.

Passiflora alata

This species is so similar to the previous one that the two of them are sometimes treated as two varieties of one species. It is a smaller, neater plant with more open flowers, of a strange color pattern. The petals and sepals are strongly colored with an almost terra-cotta purple on the inside which contrasts with the deep purple and white of the filaments. Instead of spreading outward like a halo, they arch gracefully upward and then inward, forming a deep cup around the innermost parts of the flower.

Section showing the ripening pulp in the center of a Passion-fruit. Each seed is surrounded by a juicy outgrowth, technically an aril, which gets juicier and jucier as the fruit matures.



Passiflora edulis. Passion-fruit. Purple Granadilla.

This is a very different looking vine from the previous two, though still distinctly a passion-flower to one who has seen any of the other species. The broad leaves are a shiny dark green on their top sides. Their margins are finely cut and so deeply lobed at either side that they are almost three parted. The petals are pure white and are held way back when they open. The delicate filaments of the corona are pure white but deep purple blue at the base. The stigmas, stamens, and other parts of the flower are of moderate size and finely formed and the various parts are nicely spaced from each other, serving almost as a living diagram of how a passion-flower is put together.

In the Climatron *Passiflora edulis* has grown well and flowered abundantly, though it has much longer waits between flowering periods than the previous two species. It has not fruited with us which is a pity since the bright purple fruits, about the size and shape of a hen's egg, are ornamental and interesting. Their rind is hard and they have much more acid fruits than the ordinary *granadilla's* and a fruitade made from them tastes and looks like a mixture of grapejuice and lemonade except that it is frequently so richly perfumed as to taste artificial the first time you try it.

Passiflora edulis comes from Brazil but has been widely grown throughout the tropics and sub-tropics. It has for years been a popular fruit in parts of Australia. In Ethiopia I saw a long arbor covered with it which was used to supply the mess hall of a junior college. Big pitchers of its fruitade were set on the tables and it was popular with the young men.

Passiflora allardii (*P. quadrangularis* × *P. caerulea* CONSTANCE ELLIOTT), the other passion-flower in the Climatron, was planted beside the pillars which were left over from the old palmhouse which once stood on this site and it is the chief one of several kinds of flowering vines which mantle them effectively.

Passiflora allardii is a hybrid named for the Mr. Allard of the Cambridge Botanic Garden in Cambridge, England, who produced it years ago by pollinating *Passiflora quadrangularis* with pollen from a beautiful big white variety named CONSTANCE ELLIOTT. It is a vigorous, attractive free-flowering vine and has been very widely cultivated as an ornamental, particularly in Botany and Horticultural Department greenhouses and other public and semi-public greenhouses. The big vine in the Climatron is in flower a good part of the year but most of the flowers are up on top of the portico and can be seen only from some such vantage point as the gallery walk around the west side of the Climatron. The flowers are large, beautifully proportioned, and blue and white. They are effective and attractive even in the distance. From time to time buds form on one of the branches hanging down from above and then blossoms are borne almost at eye level for a few weeks. Even then the attractive leafage of the vine as a whole creates the impression of a permanent backdrop to be more or less ignored. Not expecting the flowers, the eyes of most visitors do not spot them here and there against the curtain of foliage and they remain unnoticed unless a big sign calls attention to them.

The Missouri Botanical Garden has two other species of passion-flower in its Arboretum at Gray Summit, Missouri, 35 miles west of the Garden. They are the two species in the entire family which have evolved enough hardiness so that they can survive out-of-doors outside the sub-tropics.

The superintendent, Ladislaus Cutak, climbs a stepladder to harvest a ripening fruit of the GRANADILLA, *Passiflora quadrangularis*, for the photographer.

COURTESY OF THE POST-DISPATCH

One of these, *Passiflora incarnata,* is not native to the Arboretum but has been transplanted from southern Missouri, where it is close to the limit of its range. Country children in the South are said to eat its fragrant fruits (like little yellow-green eggs) and they are referred to as "Maypops" though they do not ripen until late in the summer, It is one of the weediest and least attractive of the passion-flowers. The blooms are mostly a washed out pink, shading into blue. The vines scramble about over each other and over other weeds and climb up a little way on fences. Farther south (it goes all the way to Florida) it is said to be more robust. It dies down to the ground in the fall and not only comes up the following spring but can spread under ground. At one of the places where it was planted at Gray Summit it has persisted with little or no attention for nearly twenty years. It has spread a little on the whole but is not an aggressive weed.

Country children in the South make little dolls out of the unopened flower buds of maypops. The petals and sepals are removed with a knife or a thumb nail. Two of the stigmas become feet, the style branches which lead to them serving as legs; the third one is pinched off. A little of the corona is left to form the hair for the girl dolls; it is all taken off for the boy dolls. The resulting objects, about an inch or so long, with their short crooked legs and protruding green bellies, are horrible little green miniatures of some of the primitive black sculptures from Africa. They are so very similar that I have wondered if this bit of folk art might have spread up from the tropics in the times of slavery.

The Ozark passion-flower, *Passiflora lutea,* is native to the Arboretum and has increased slightly during the years the Garden has protected the cedar ridges where it grows, from fire and pasturing. It is very close to the northern limit of its range with us, which may explain the fact that not one vine in three bears flowers and that ripened fruits have been seen only a few times.

The authoritative "New Britton and Brown, Illustrated Flora of the Eastern United States and Adjacent Canada," says that *Passiflora lutea* grows in "moist soil." During most of the growing season the ridges where *Passiflora lutea* grows at the Arboretum are almost as hot and dry as a desert. The rock is frequently within a few inches of the surface, or actually exposed as outcrops. If there is much precipitation in winter and spring the water will ooze out along the joints in the rocks, though not as actively as on the nearby glades of thin bedded dolomite. In summer except immediately after a rain these ridges are hot and dry; on a muggy day they are pleasanter to walk through than the moister woodlands down below with heavy shade, no breeze, and lots of mosquitoes. Whatever they may do farther east and south, here the delicate little vines of *Passiflora lutea* climb up red cedars, Indian Currants, or Bumelias. Many of the vines are only about shoulder high and do not fruit. They are never really plentiful. A dozen or so can be found on one ridge by those who know where to look for them. Occasionally one finds a vine in bloom, a flat little flower, exquisitely formed, smaller than a twenty-five cent piece and all of it, including the visible parts of the corona, a slightly greenish yellow.

Finding *Passiflora lutea* in bloom in the Ozarks is a strange experience for a naturalist who has some knowledge of the group of plants from which it springs. It is the final link in an evolutionary series tracing back to scores and even hundreds of tropical species brilliant in color, exotic in design, many of them in the hot, wet tropics. This dry rocky ridge along which we have come upon the flowering vine seems like another world; there is little of tropical magnificence about the blossom itself. Yet with a second look (or perhaps with a second visit) one percieves that the three-lobed leaves are nicely proportioned, the climbing tendrils are evenly coiled, the central coronas, though practically the same shade as the rest of the flower, are beautifully formed.

EDGAR ANDERSON

THE BAND CONCERT FOR FRIENDS OF THE GARDEN ON JULY 23RD

ON THE evening of July 23rd the Garden expressed its thanks to the "Friends" with an informal old-fashioned band concert. Not since Henry Shaw was seranaded here with a St. Louis band on one of his later birthdays has there been a remotely comparable occasion. A St. Louis bandmaster, August Ponstingl, and his "Viennese Serenaders" provided the music from the terrace between the Desert House and the Climatron. Several hundred seats had been provided in among the trees at the west edge of the Knolls and there was a bar close by with beer and a soft drink on tap.

It was a family affair and a good many of the visitors brought rugs and cushions for the children or grandchildren to sprawl out on. The music was just right for the occasion, a good deal of it old German tunes and songs in some of which the audience joined. If you felt like leaning back and listening, the music fitted into the outdoor setting. If you wanted to talk quietly to your neighbor on the right or left, the atmosphere was just right for that too.

Much friendly visiting went on during the intermission and the Climatron had a capacity crowd at that time. During short pauses between selections Mr. Harry Wuertenbaecher, Jr., and Mr. Henry Hitchcock spoke briefly, presenting the Garden's thanks and calling attention to the Garden's needs. The weatherman cooperated with a handsome (and lingering) sunset as well as a pleasant breeze. For the crowd of around 650 people it was an evening to be remembered.

OUR WORST WEED BECOMES A TRIPLE PROBLEM

A GOOD many years ago Mr. Paul Kohl wrote an article for the BULLETIN about the worst weed in the Garden, a climbing vine in the Milkweed Family. Since that time it has become increasingly serious in St. Louis and in the southern Middle-West generally. Summer mulching, in many ways so beneficial for flower and vegetable gardens, tends to encourage it. Chemical weed sprays are less help than hand-weeding. Every year more and more mature old vines become established as infective centers from which seeds are spread far and wide by their horribly effective parachutes. When they get going in a big clump of thorny bushes then the problem of getting rid of them reaches epic proportions.

As if this were not trouble enough, there is the problem of what to call them; it is really two problems. They seem to have no genuine common name and at the moment every authority you consult gives you a completely different scientific name. There is a sound basis for this lack of agreement among the scientists. The little greenish white flowers which occur in tight flat-topped bunches where the leaf stalks leave the stem, do not look very complicated. Study of them and all the other climbing milkweeds, using a good dissecting microscope, shows that they are almost as intricately put together as orchids and that the relationships between the different sorts are complex. Careful studies such as those made by Dr. Robert Woodson of the Garden Staff have not yet brought general agreement. The late Professor Fernald of Harvard decided that *Gonolobus laevis,* which he had previously used in the 7th edition of Gray's Manual, was a mistake and that the proper name to use was *Ampelamus albidus.* The equally eminent Dr. Gleason of the New York Botanical Garden continued to hold out for *Gonolobus laevis.* Dr. Woodson, whose studies of this group focused on the entire family, throughout the world, has come out for *Cynanchum laeve.* Because his studies are the most inclusive, his judgments are most likely to prevail—in the end. But this will take time. The most practical thing for the present is probably to follow Professor Fernald since his edition of the Manual is widely looked up to. For one thing, though scarcely really a "manual," it is all in one volume, and gets into a great many libraries, private and public.

There is a third problem, the lack of any generally accepted common name for *Ampelamus albidus.* This is not easily remedied. Common names belong to the common people. When they finally hit upon one they generally do a good job. The best, such as "Jack-in-the-Pulpit," add to the poetry of common speech. "Red Top" gets accepted for one of our common grasses and "Blue Grass" for another though it is usually only after years of experience that one sees either of these at just the time of year and in the proper light to make them look red or blue.

Fernald cites "Honeyvine" as a common name for our weed. This would not be a bad name if people would use it. I personally have never heard it called that or met anyone, amateur or professional, who knew of the name. The flowers are indeed sweetly and strongly scented, though I have never noticed the distinctive aroma of honey in smelling them. If any readers of the BULLETIN know of common names which are really current for this weed, I should be glad to hear from them.

In the St. Louis area the honeyvine is easily told from the other climbing milkweeds or from the bindweeds which it somewhat resembles in its habit of growth. Its little bunches of small white flowers coming out at joint after joint along the stem are like nothing else in our flora. Its leaves are

* * *

The Ponstingl "Viennese Serenaders" perform for the Friends of the Garden in front of the Climatron. The high trees of Cecropia and Balsa which show up inside the Climatron were just nicely started as potted plants when the Climatron was first opened, three years ago. Photo by Dorsie Ryther.

COURTESY OF GLOBE-DEMOCRAT

Viennese Serenaders

shiny, heart-shaped with a distinct point at the end and facing each other in pairs along the stem. When they first come out the leaves are narrow and small. It is not until the vine begins to get going in the heat of July and August that they broaden out, becoming a darker and darker green and as big as a morning glory leaf. They are easily distinguished from other weeds when they come up in the shade. The leaves stay tiny and the stem elongates, so there can be several inches from one leaf pair to the next. This is the time to pull up the honeyvines if you can only learn how to spot them coming up under big bushes or down in under smaller ones.

When I moved into the Garden some years ago I had just succeeded in getting under control the bindweed with which our grounds on Flora Place had been heavily infested. I had learned to start every time on the outside of each patch and to work in toward the center and to eliminate it if possible twice a week throughout the growing season. I did not anticipate a much more difficult time with the honeyvine. I soon learned better. From an old root it not only sprouts up vigorously but it can come to the surface at a point several feet away. The original vines were big ones; they had got going in a line of shrubs which were no one person's responsibility. Eleven years later there are still big sprouts coming up in this area, though not so many nor as big as they were at first. And every year there has been the problem of this year's or last year's seedlings which had got started from seeds which floated in on the wind.

The honey vine is of interest to naturalists because unlike most of our weeds it came from the native flora and not from ancient centers of civilization. *Ampelamus albidus* is native from here to Pennsylvania and western Alabama and as far west as Kansas and Nebraska. Nearly all the specimens in our herbarium come from sandy thickets in the flood plains of rivers or creeks. Its marked increase in St. Louis in the last half century suggests that weedier strains of it have been selected since the country was first settled and that it may be these specialized strains which are so difficult to combat. Dr. Engelmann, for instance, collected it in St. Louis nearly a century ago but in the immediate valley of Mill Creek, near Chouteau's Pond, in other words close to the present Union Station. One early collection is along a railroad track but it is at Jefferson Barracks where the railroad is practically in the flood plain of the Mississippi.

EDGAR ANDERSON

* * *

THE CHINESE PARASOL-TREE IN 1963

Last year we figured and described the flower-like fruits of this curious tree, *Firmiana simplex*. For many plants last winter with its extreme cold spells and rapid changes from hot to cold, was the most difficult for tender plants we have had in many years. It was not surprising to find our good-sized tree of Firmiana killed to the ground this spring as it has been many times before. With hot weather and good rains its stump sprouts were higher than your head by late July and have been an interesting feature of the planting on the south side of the lunching area between the Climatron and the Floral Display House. The leaves on the stump sprouts are large, even by tropical standards, much larger than those on the tree when it flowered last year. The largest were over two feet across and there were many others which approached that size. In their attractive lobing, as well as in their size they resemble the closely related Sterculias in the Climatron, near the southwest end of the bog.

E. A.

MOTH MULLEIN IN A SUBURBAN LAWN

A query which came to the Garden about "a pretty little white flower on stems a few inches high, coming up in the lawn" didn't quite fit any plant that we could imagine and so a specimen was asked for. It proved to be the variety *albiflora* (white-flowered) of the common Moth-Mullein, *Verbascum blattaria*, somewhat dwarfed by having been mowed back and by having to compete with the lawn grasses. With this treatment it had made quite charming little plants. Our inquirer moved several of them from the lawn into the garden where they looked attractive, continuing to bloom up the stalk but not becoming shoulder high as they usually do.

The flowers of this variety are really an off-white rather than a pure white, being a purplish pink at the base, fading off to a barely perceptible tint in the rest of the flower. Moth-Mulleins are seen here and there every year in the St. Louis area. From a springtime rosette of bright green leaves they shoot up into narrow branching wands of gracefully spaced yellow or pinky-white flowers, followed by neat little spherical seed boxes the size of a large pea. They never look really weedy, even when they go to seed, and might be worth bringing into the flower garden except that they are biennials, requiring two growing seasons to flower and not fitting readily into the schedule of an ordinary garden.

E. A.

WE ANSWER THE VISITORS

Going through the Main Gate is an exciting and new experience for Mr. and Mrs. Visitor and satisfying their curiosity is a gratifying one for those at the Main Gate Office. A barrage of questions usually follows the spin of the turnstiles and we enjoy answering them. Following are typical questions and remarks we diplomatically endeavor to cover with added information.

Is this Shaw's Garden? Is it the same as Missouri Botanical Garden?

Yes, it is. You will notice the inscription outside overhead reads: "The Missouri Botanical Garden 1858." This was Henry Shaw's original lettering which was removed from his entrance and replaced when this one was built in 1921. It is a duplicate of his original entrance. May we interest you in one of our Tour Bulletins?

Is that the (Cyclatron, Climatorian, Dome, Glass House) written up in Life Magazine?

Yes, right ahead of you is the Climatron. It will be three years old in October. You may obtain literature at the entrance. We have brochures and postcards here.

What are those pretty shaped evergreens all in a row on each side of the Lily Pools?

They are the Bald Cypress *(Taxodium distichum)*. They are deciduous (they lose their leaves). These are the same trees you probably are familiar with in Florida and Louisiana which throw up knees. In the North American Tract of the Garden near the Lake we have some showing knees. The oldest specimen in the Garden can be seen near the Alfred Avenue and Castleman entrance, originally planted by Henry Shaw in his arboretum.

Can I grow some of these beautiful Water-lilies? Where can I buy them?

Yes, you can grow them in your garden. They are our hybrids developed by Mr. George Pring through years of research. They may be purchased at leading Water-lily concerns throughout the U.S. If you like we can give you the address nearest you. The best time to see these and for making pictures is in the middle of August when they have matured, on a sunny day between 10:00 and 12:00 in the morning when the night bloomers and day bloomers are both open. You ask why there are proper names on these plants. They are all named by their originator. For instance, the first yellow hybrid, a day bloomer, was originated at the Garden by Mr. Pring and named "St. Louis" by him. Two outstanding night bloomers are "Missouri," pure white, and "Mrs. George Hitchcock," a deep rose named after the mother of the President of the Board of Trustees.

What is the name of those big floating pads? Can children really stand on them?

Yes, when they are mature with leaves four to six feet across. The weight must be equalized by placing on it a piece of plywood cut the shape of the leaf. We have postcards showing this. The name is *Victoria cru-*

ziana. A new hybrid was originated at Longwood Gardens in Pennsylvania by Patrick Nutt, intercrossing *V. cruziana* and *V. amazonica.* One of those is at the front of the pool nearest to the entrance.

Can I grow these lovely plants (tropical bedding) in my garden?

Yes, but they are all tropical and must be obtained from the florist. The favorite is Copper Leaf *(Acalypha).* The dwarf borders are Santolina, gray or green, and Alternanthera, yellow or purple.

Are all of these grown here?

Yes, cuttings are taken in early September, rooted in our Progagating House, later potted and placed in the growing houses through the winter, then planted out the first week in May. All floral displays are supervised by our floriculturist, Mr. Paul Kohl.

What do you do with these plants after the first frost?

They are dug up and the beds are all rototilled in preparation for the planting of tulips for the spring display.

The above are only a few of the usual questions made by Mr. and Mrs. Visitor. A good many start out with: "Who was Mr. Shaw?" and "How did he make all his money?"; "How many acres are here?"; "How long does it take to go around the Garden?"; "Do you have guides?" "Where is there a nice place to eat?"; "Why do you not advertise more?" "If you had markers along the highways and streets it would be much easier to find you"; "Is there someone here who can help me with my garden problem?"

Answering the first one of course opens the way for a short history of Henry Shaw's life leading up to his lovely old home situated in the Garden where he retired and his city home which was removed from its downtown site to the Garden according to his will. Many are so fascinated by this after touring the Garden that they purchase Henry Shaw's Biography and pictures of the Garden, leaving with such remarks as the following:

"I've never seen so much beauty before in all my life."

"This is the best thing that has happened to me since I came to St. Louis."

"I only wish I had more time to spend here."

"This bus tour isn't long enough. Tomorrow I'm returning by myself to enjoy it."

And so our visitors leave with a flower in their hearts, promising to return some day soon, but the stories they tell when going home adds Shaw's Garden to a list of "musts" on many a vacation plan.

Mabel Shepherd

FRIENDS OF THE GARDEN PICNIC

As a result of the many demands for another picnic at the Missouri Botanical Arboretum, Gray Summit, plans are well under way for a second picnic for members of the Friends of the Garden and their children. The date is set for Sunday, October 6, from 11 A. M. to 5 P. M., so be sure to mark your calendar now. Plan to bring your own lunch and picnic wherever you please in the lovely 1600 acre setting of the Arboretum. Because of the danger of fire we regret that cooking will not be possible—either by camp-fires or portable grills. Also, we are sorry but dogs are not allowed in the grounds due to the wild life there.

Throughout the day, nature walks starting and ending at the Trail House, will be conducted by members of the Garden Staff. There are four lakes from which to fish, for any who wish to do so—be sure to bring your own equipment and license.

Cars will be parked immediately outside the main gate for personal safety and preservation of the Arboretum. We will provide buses which will make continuous round trips in the Arboretum throughout the day, picking up and discharging passengers wherever they desire.

Invitations and further details will be mailed to Friends of the Garden later this month—meanwhile, reserve the day—Sunday, October 6.

THE NEW SNACK BAR IN THE FLORAL DISPLAY HOUSE

Various difficulties having arisen in connection with the restaurant in the south end of the Floral Display House, it has been discontinued, and a Snack Bar has been installed. For the present it will be open from 9 to 5 on Mondays through Thursdays, later than that over the week-ends. Coffee, soup, sandwiches, quality frankfurters and ice creams are now the extent of the menu. Other foods will be added if it proves possible to forecast attendance.

Only someone who sees the Garden day-by-day, winter and summer, can imagine the way the attendance varies. May brings busloads of young people from the schools of Greater St. Louis and beyond, as far away as Iowa. June and July bring carfuls of the modern American family, children and parents seeing the country. They have read about the Climatron and they are eager to see it. When the weather gets much above 80, however, many families apparently don't even stop in the city. With the first cool day, little groups of them will again be seen in the Garden all day long. With good weather there are heavy crowds on Sundays while some of the special flower shows bring mobs of visitors. All of these people differ in the kind of food they would like and how much they would be willing to pay. Food Service Management, Inc., which is operating the Snack Bar, has had extensive experience with such problems. They are now feeling their way into the new experience here. One of their aims is to work out effective ways, when arrangements are made in advance, of serving light luncheons to organizations who come here for a group meeting or tour.

SATURDAY MORNING NATURAL SCIENCE FOR CHILDREN

Time: 10:00 to 11:30 A. M.

Place Shaw's Garden—Museum Building or Research Greenhouse.

September 7 — "The Mighty Oaks." Children will make collections to take home.
September 14 — "The Hundred-in-One Flower." A study of early Fall flowers.
September 21 — "Dangerous and Useful Mushrooms and Fungi." Natural Science study.
September 28 — "Plants with Split Personalities." Children will take home samples.
October 5 — "Planting Bulbs." Children will bring a one-pound coffee can and plant Narcissus bulbs to take home.
October 12 — "Fall Treasurer Hunt." A contest in solving riddles and trail finding. Prizes for all.
October 19 — "Fall Colors." Children will paint or draw scenes. The Garden will provide all materials.
October 26 — "The Forests of the Rocky Mountains." A travelogue through the Rocky Mountains.

COMING SHOWS IN THE FLORAL DISPLAY HOUSE

August 31 through September 8 — Henry Shaw Cactus Society Show
September 14 and 15 — Nothing scheduled for this week-end
September 21 and 22 — Harvest Show of the Regional Council of Men's Garden Clubs
September 28, 29 and 30 — Dahlia Show
October 5 and 6 — Allied Florists Show
October 31 — Chrysanthemum Show Preview for Friends of the Garden
November 3 through December 1 — Chrysanthemum Show
December 8 through January 12, 1964 — Poinsettia Show

LIFE MEMBERSHIPS

Mr. and Mrs. Howard F. Baer
Mr. and Mrs. Henry Hitchcock

NEW MEMBERS OF THE FRIENDS OF THE GARDEN

May 21 through July 31

Mr. and Mrs. Don Blackburn
Dr. and Mrs. Neal S. Bricker
Cavalier African Violet Club
Engler Acres Garden Club
Mr. K. C. Hartwell
Mr. and Mrs. Edward L. Hotze
Mr. and Mrs. Kenneth H. Hunt
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Mr. and Mrs. William J. Vestal
Mrs. C. Corwith Wagner
Miss Flora Walther
Mr. and Mrs. Ben T. Winn
Mr. William J. Woltering

FALL COURSES

Just as a reminder, here are some notes and dates on courses and children's classes previously announced for this fall:

BULBS, INDOOR — OUTDOOR

Instruction on bulb forcing and outdoor bulb culture. The Garden will supply each student with 24 top quality bulbs in 7-inch clay pans which may be taken home. The Garden will also provide space for cool treatment which the forced bulbs require. A practical and timely course for October.

2 Sessions — Fee $8.00	**Experimental Greenhouse**
Tuesday evenings — 8 to 9:30 P. M.	**October 1, 8**
Thursday afternoons — 1 to 2:30 P. M.	**October 3, 10**

Instructors: Mr. Clarence Barbre
Mr. Kenneth Peck

HOW TO PROPAGATE FROM CUTTINGS

Fundamental facts and procedures of producing trees, shrubs and perennials from cuttings (asexual reproduction). The Garden will supply a plastic covered metal propagating flat, media and plant materials for 40 to 50 kinds of plants. Student practice will emphasize propagation of house plants such as begonias, dieffenbachias, and philodendrons. Some attention will also be given to hardwood cuttings. The following methods of vegetative propagation will be used: root cuttings, suckers, divisions, hard and softwood stem divisions, hard and softwood stem cuttings, leaf, bud and scale cuttings.

5 Sessions — Fee $12.00	**Experimental Greenhouse**
Tuesday evenings — 8 to 9:30 P. M.	**October 15, 22, 29, November 5, 12**
Thursday afternoons — 1 to 2:30 P. M.	**October 17, 24, 31, November 7, 14**

Instructors: Mr. Clarence Barbre
Mr. Kenneth Peck

PLANTS UNDER ARTIFICIAL LIGHT

Latest up-to-date thoughts and practices on the use of artificial light for plant propagation and culture, illustrated with practical equipment for the amateur or professional grower.

2 Sessions — Fee $5.00	**Orchid Greenhouse**
Thursday evenings — 8 to 9:30 P. M.	October 17, 24

Instructor: Mr. Robert J. Gillespie

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Henry N. Andrews, Paleobotanist

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Ernest Bibee, Horticulturist

Louis G. Brenner, Grounds Superintendent

Christopher Chowins, Horticulturist of Tropical Plants

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James Hampton, Assistant Engineer

Paul A. Kohl, Floriculturist

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Viktor Muehlenbachs, Research Associate

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Frank Steinberg, Superintendent of The Arboretum, Gray Summit

George B. Van Schaack, Librarian and Curator of Grasses

Trifon von Schrenk, Associate Curator of the Museum

Robert E. Woodson, Jr., Curator of the Herbarium

SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 9:00 P. M. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

October 1963
Volume LI
Number 8

COVER: Red Cedar, Pine (left foreground) and Oak in an old pasture reverting to woodland in Canaan, northern Connecticut, in 1957. Note how similar it is in the general elements of the landscape to many places in southern Missouri.

COURTESY OF CONNECTICUT AGRICULTURAL EXPERIMENT STATION

CONTENTS

The Connecticut Forests and What To Do About Them
First Monday Lecture
Early Fall Color as a Danger Sign
Tower Grove House
The Nutmeg Trees and the Colonial Administrator
The "Girasole": If You Insist, "Jerusalem Artichoke"
Members' Preview, Chrysanthemum Exhibition
New Members of the Friends of the Garden
Saturday Morning Natural Science Programs for Children

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Vol. LI No. 8 October 1963

THE CONNECTICUT FORESTS AND WHAT TO DO ABOUT THEM

Reflections from a Fascinating Conference

EDGAR ANDERSON

In the early spring of 1962, our director, Dr. Went, and nine other scholars from the United States and England met by the invitation of the Connecticut Agricultural Experiment Station of New Haven for three days of lecture and discussion. The problem which brought them together is one so broad and far reaching that in 1957 the New Haven Experiment Station proposed the name "Suburban Forest" for the two million of Connecticut's three million acres which are now covered by trees, though half this area had once been cleared and cropped.

While the Suburban Forest has become a major problem only in the East, similar situations are developing in other states. The New Haven Station accordingly drew upon its endowed "Lockwood Fund" to bring these distinguished men together in the presence of sixteen members of its staff and to publish the seven formal lectures as well as lively selections from the informal discussions which accompanied them:

(Bulletin 652 of the Connecticut Agricultural Experiment Station, New Haven, Connecticut; *Proceedings of the Lockwood Conference on the Suburban Forest and Ecology.*)

Though it does include some highly technical material, much of this 102 page bulletin is of general interest. Several of these conferees are gifted writers and effective speakers; parts of the discussions are downright entertaining. They are of more general importance than that, however, in these days when Science plays an increasing role in public affairs. They paint a faithful as well as interesting picture of what able modern scientists are like, of the give and take between them, of how as a group they can approach a general problem of which no one of them is the master and see new ways to interpret it and new ways to study it.

The Bulletin begins with a forceful presentation of the problem of the Suburban Forest by Dr. Paul Waggoner of the New Haven staff, a student of plant diseases whose field of view has widened as he has lived with this problem:

"The release of land, and of people from the land," says Dr. Waggoner, "in our time has not come with the terror of pestilence. But it has left fields untilled and farmsteads unwanted. Our clothes of productivity, so generously fashioned, hang loose upon us despite our growing numbers. We are two small for our breeches. . . . Farmers are abandoning land faster than it is demanded by cities. Coons and skunks multiply, having discovered their affluence in the garbage pails of the anxious exurbanite now living on forsaken farm land in the suburb.

"It is these haunts of the coon and the skunk, these lands of the carpool and the PTA, that with their greenery comprise the suburban forest that concerns us here. . . . 'Open space' is the 1-acre that busies the suburbanite's weekends, the matrix of the turnpike exchange, the handsome grounds of the new power plant. It is the abandoned pasture invaded by red cedars or the second-growth oak invaded by gypsy moths.

"This is the suburban forest we want to understand, perhaps improve. We needn't spend our time here speculating whether it will be, whether it should be, or whether it need be promoted. It already is; it is increasing, and it will last for many years. We need spend our time learning how to live comfortably with it."

At this point he identifies the problem as an ecological problem and ecology he defines as "the study of how plants and animals live together, how they are ruled by their environment and how they modify the environment." This is a pointed remark aimed at the seven guest lecturers for they are all either professional ecologists, or scientists like Dr. Went who by basic studies have brought illumination to ecological problems.

Dr. Waggoner's paper is followed by three full pages of discussion which is not only interesting to read but gives a good working example of a bunch of scientists trying to agree more precisely on a term they are using. A few excerpts will give the general flavor of the discussion; but first to introduce briefly these men from whom we are quoting below:

H. A. McKusick, Park and Forest Commission, State of Connecticut.

Dr. Marston Bates, Professor in the Department of Zoology, University of Michigan, Ann Arbor. Increasingly well known as an author. Several of his books, as for example, *The Forest and the Sea*, sell well at the book shop maintained at the Garden's Main Gate.

F. Fraser Darling. A British ecologist who demonstrated that the ecology of the animals in some of the wilder parts of Great Britain was closely tied up with the behavior of the people who lived in those same areas. He is now with the Conservation Foundation of New York City.

Dr. S. H. Spurr. Professor of Forestry, University of Michigan. Earlier in his professional career he worked at the Harvard Forest in Central Massachusetts where he became aware of the kinds of problems which have developed in Connecticut.

J. D. Ovington, The Nature Conservancy. St. Ives, Huntingdon, England.

Dr. M. B. Russell. Professor of Agronomy, University of Illinois. A soil physicist.

Dr. G. R. Stephens, Jr., Station Staff, New Haven.

Now for a few highlights from the discussion:

McKusick. "I think it would be helpful if we could identify the suburban forest. Does forest become suburban when the cost of land and the carrying charges of land exceed its productivity in timber, in wheat, or corn or whatever? Is this what we are talking about?"

Bates. "To me, the suburban forest is an area which has a considerable tree growth and is primarily residential in purpose, e.g., New Haven, Greenwich and Middletown. A reservoir, a park, a reservation, or a wildlife refuge are presumably something else."

Darling. "I think Bates is rather trying to limit the suburban forest and to define it rather heavily, more than we should. The suburban forest, wouldn't you say, it that forest which is used by a certain number of people. I know that it will vary in the amount of treading it gets, but at the same time the degree of treading is probably a very good criterion of forest use, of suburban forest use.

"We have to realize that with the suburban forest what we want more than anything else is amenity."

Spurr. "Darling has brought out a British word which we don't use. 'Amenity' is a very nice summing up in one word of what some of our desires are. . . .I can see an ownership pattern in how it is going to be managed. A watershed forest has got to be managed differently from a woodlot that is in private ownership. A woodlot that is owned by a lawyer in New York will be managed differently from a woodlot that it attached to a farm. To me, however, all this is part and parcel of the same biological community."

Russell. "We are in the usual semantic difficulties. . . . If we are really going to get out of the area of philosophy and semantics and come to grips with some of the more specific problems we must ask the Station staff to define this forest."

Stephens. "The suburban forest in Connecticut is that part of our forest land which is man-oriented. It is the land surrounding and permeating the clearings for cities, farms, homes, and highways. This land contains sufficient trees to give a wooded appearance and is generally excluded from horticulture and agriculture. A suburban forest provides privacy, varied scenery, recreation, and a backdrop against which man carries out his daily activities."

The next section of Bulletin 652 is given over to Dr. Went's lecture: *The Forest: What It Does and How It Is Established.* Much of it is easy reading: "I would like to suggest specific functions of a forest. What I would like to stress especially is the climate control which a forest gives. Actually forests, street trees, and parks act more or less as air conditioners for a city. . . . A forest acts as an air conditioner, keeping temperatures much more even and preventing excessive heating during the day. This is in sharp contrast with what is measured in the desert where there are big extremes in temperature from day to night.

"There is the possibility that oaks from an abandoned oak forest remain alive for a long time in areas which are regularly grazed, for instance in Australia and Israel. Here it was shown that originally the oak population was very high in the Judean hills. But 10 years ago there were no oaks growing anywhere at all anymore. When the goats disappeared with the Arabs, then suddenly oaks came up everywhere and there were definitely no acorns about. When they dug up these oaks, it turned out that each low oak tree was attached to a very heavy root which had been there for centuries probably, so that the oaks remained alive because each year a few more shoots came up which were, of course, regularly grazed off."

* * *

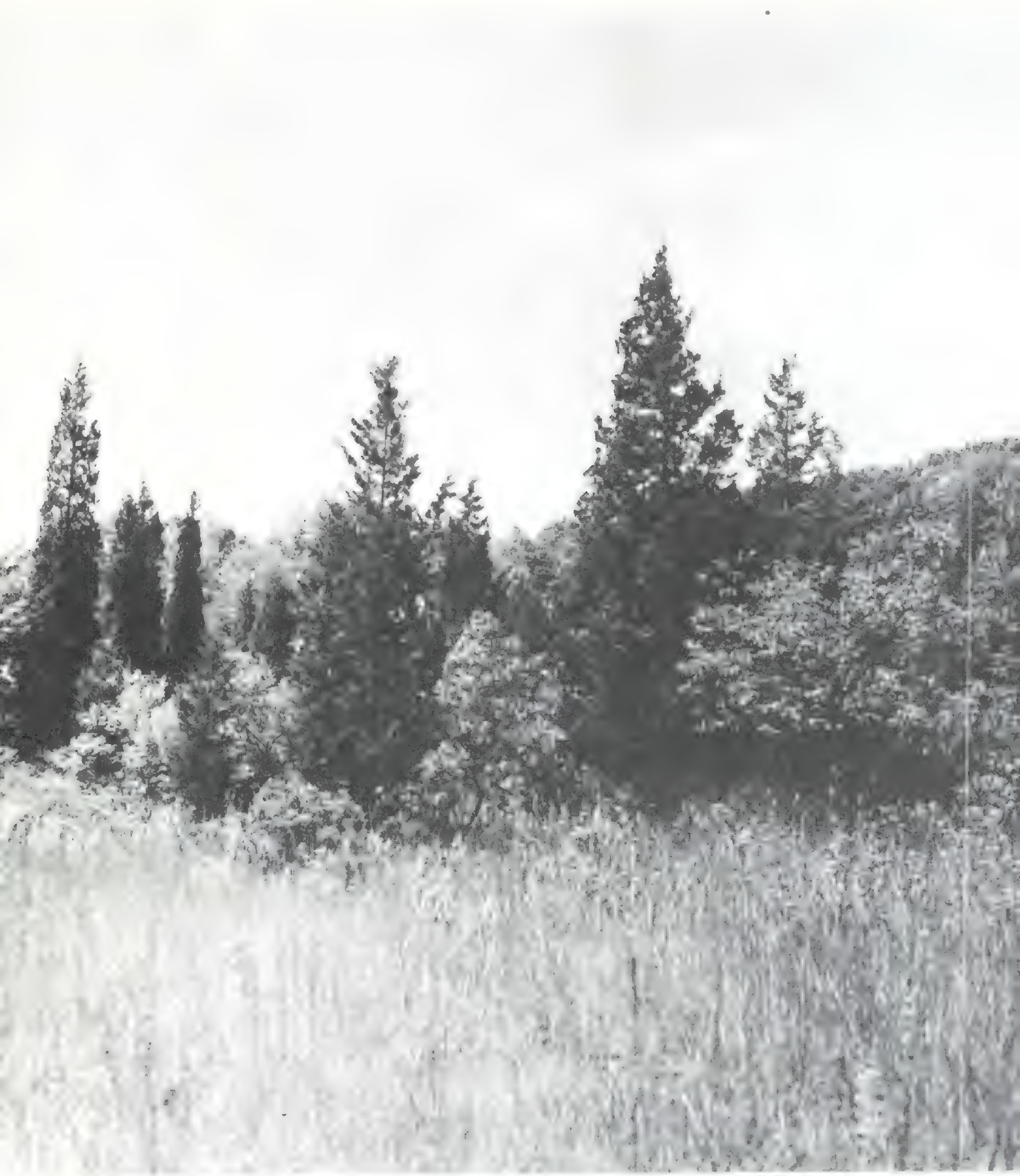
"There must be proper sources of seed and that is again exceedingly interesting in the case of oaks or horsechestnuts. Those seeds have to go through the winter but you cannot store the seed. If you collect horsechestnuts or acorns and keep them over winter and put them out next year, you have lost all of them. They just don't germinate. What happens in nature? In the first place, the optimum water content of these seeds can be maintained by storing them at a humidity of about 80 per cent, where they maintain their viability. When they are kept at 100 per cent they rot, and when you keep them at 60 per cent they lose their viability completely, so you must store them at a rather high humidity, which, of course, is done if they are stored in the soil. This of course happens when they have been buried by squirrels or birds. These seeds usually also need stratification, such as the horsechestnut. This does not germinate in spring if it has been stored in the laboratory because it needs a cold period. Again, if we had these buried in the soil then they get that also, and that is the reason why you find horsechestnuts germinating in many places if there are areas where squirrels can bury them. So for this we need also an animal population."

* * *

"After a good seed year in maple forests, you will find seedlings by the millions, but in the tropical forest, germination is a rare phenomenon. One of the most remarkable things about that is that you never find a seedling of the old tree, under this tree. You find them only away from the tree. So apparently there is a specific inhibition as it is shown in so many desert plants, an inhibition of germination by the mother plant. This is one of the major factors why you do not get pure stands in the tropical rain forest but why there are several hundred different species forming the mature forest.

* * *

"Once established, the old trees prevent the germination of new ones. In recent years I have visited several rain forests and found relatively few seed-



A Connecticut pasture (Mianus area) on its way back to forest. Note the older woodland in the background. Photographed late in the summer. Similar to many scenes in southern Missouri except that the more columnar variety of the Red Cedar (*Juniperus virginiana* var. *crebra*) becomes more marked in the North.

COURTESY OF CONNECTICUT AGRICULTURAL EXPERIMENT STATION lings. This was true also in Java where I worked more than 30 years ago. Of the few seedlings which do develop most will continue to grow and develop into small trees. . . . A considerable number of trees had been measured by Koorders in 1890. When I remeasured these same trees, which fortunately were numbered and could be located, it turned out that the large trees had either grown considerably in diameter or they had died. The small trees, on the other hand, which were growing in the shade of the old jungle giants, had not grown at all in most cases and had just marked time to be able to start growing the moment the shading tree had disappeared. This is a normal pattern of rain forest growth which we are reproducing at present in the Climatron, the new greenhouse at the Missouri Botanical Garden. We hope to establish there an actual Amazonian rain forest, but this has to be done by first planting a number of fast-growing secondary forest trees and underplanting them with young slow-growing trees of the primary forest."

* * *

"Thus the first ecological interest I see in the forest of the suburb is its effect on the suburban microclimate, ameliorating the concrete deserts of the cities. The second is the establishment of a new forest on forsaken farms. My experience tells me this may be a problem of seed germination."

Dr. Went was followed by Dr. Spurr, who talked about what kinds of needs the Suburban Forest would have to fill: "Not only does the forest buffer us from the elements, but it also buffers us from all mankind. I might preface this point by drawing on my own experience. For a number of years, I collaborated in studies on the gypsy moth, and those studies included one sample plot which represented for that locality the worst of all possible gypsy moth hazard conditions. When I myself came to buy a farm in New England, it just so happened that I bought the farm that contained this particular sample plot. In other words, the fact of poor forest site quality did not influence my judgment in buying the land. I wanted the land because I wanted 90 acres of space around me. This was the value that I purchased."

* * *

"Living in close contact with our compatriots, we have the urge to get apart from them, at least sometimes. When we are in the middle of the forest, we are protected because the forest is a great insulating blanket—a layer of balsam wool as it were—that not only protects us from the elements, but also protects us from the sounds, the smells, and the sights of the urban civilization which surrounds us. It is a protective cover which filters sound, filters smell, blocks our vision, and perhaps helps to filter radioactive fallout. I submit that the suburban forest is of prime importance to us in providing a feeling of space and a feeling of privacy.

"Just as it is important to us that we be buffered from civilization, it is equally important that the filtering structure which buffers us is also attractive. Here we must come to human values and judgments; for what is attractive to one of us is not necessarily attractive to another, and what is attractive in one age may not remain so in another. Without being an expert on æsthetics, I may, nevertheless, list attributes that are generally desired in the suburban forest. One is greenness. There is a restfulness in greenness, particularly in the muted light within a vigorous forest. For another, we wish our forest to be as varied as possible. There is a monotony in numbers. We don't like too many goats on the mountain sides, too many gypsy moth larvæ in the trees, or even too many trees all of one kind and of one size. There must not be too much disease, or too many of any insect or other animal predators. We desire a healthy balance of plants and animals, varied in kind, size, and locality."

* * *

"When we speak of preserving the native fauna and flora, perhaps we really wish to preserve our own childhood picture of the locality. If a plant or animal is part of our preconceived notion of how the forest should look, we approve of its being there. If not, its presence adds a note of incongruity. Consider the pheasant. I am sure that many people in my part of Michigan think of the pheasant as a native bird, and that there are few who, knowing that it is introduced, would like to eradicate it. . . . My point is that we don't really care whether a plant or animal is introduced or native. What we do care about is whether it seems to us to be a normal part of the environment and whether it is an attractive and esthetic part in accordance with our own preconceived notion of how the environment should look."

Professor Marston Bates then lectured on the changing ways in which man fits into biological communities, in part because of his changing ideas. In the course of his discussion he made several interesting points:

"We must have been social for a long time because solitary man is a pretty puny and helpless creature. We have also been carnivorous for a long time. Our physiology is adapted to the digestion of raw meat, from oysters to beefsteak—and I at least prefer my meat that way. Our ability to handle vegetables without fire for cooking is much more limited; our physiology is not adapted to the digestion of raw potatoes."

"Furthermore we do not tolerate competition. We don't want to share our sheep with wolves, our chickens with hawks—we won't even share our apples with worms, even though the worms might add to the nutritional value. This man-altered, simplified system, of course is more efficient than the natural complexity. . . . Charles Elton in his lovely little book on "The Ecology of Invasions" has shown that the danger of this simplification is the liability of catastrophe. It seems to me that this is fairly well documented."

"I lived for a while on an atoll in Micronesia, where the spirits that governed typhoons were just as real, just as important to cope with, as the sharks in the lagoon. The suffering from the violation of a taboo can be as painful as the wound inflicted by an animal; in both cases sometimes fatal.

"From my exalted position as a scientist in the tradition of Western civilization, I could see that this fuss about spirits was a lot of nonsense. The people had made the spirits themselves, and then were reacting to them. But on thinking further, we have little reason to be holier than thou toward the Micronesians or any other culture about their ideas. We Westerners, too, live in a world of ideas, a world that we (or our ancestors) have created and that yet influences our every action."

* * *

"Our attitude toward the suburban forest is an example. Yesterday Spurr started out by talking about our need for space, how the residential forest served as a buffer between man and man, family and family; a buffer also, as has been pointed out against noise, dirt, perhaps even fallout, and a moderating influence on climate. I think probably everyone here feels the same way that Spurr does—wants trees in his yard because we share a value system. But I remember one summer in Sardinia being struck by the way the towns abruptly gave way to open fields with no trailing out into suburbs and isolated houses. The same thing is true of Rome, Florence, and many other Mediterranean cities and towns. There will be big apartment houses right up to the beginning of the agricultural land.

"This puzzled me, and I remember asking why people should live all crowded together with all of this space about. But I was told they liked it that way—they didn't want separate, independent lives; on a holiday even, they all crowd together again on some beach. Perhaps it has something to do with the feeling of belongingness, of reassurance from close interpersonal association. This poses the problem of who is right—we who want some measure of protection from each other, or they who want to crowd together. . . . How is my need or convenience to be reconciled with yours? I rapidly get lost when I try to think about this, and everyone I know seems to be about equally lost."

"Often when I start talking about our civilization I sound as though I wish I were living back in the Neolithic. But this isn't true. Some aspects of the Neolithic may have been fun, but I would want to have my dentist with me, and modern equipment for coping with lions and diseases. Our civilization does have values, and among the greatest of these is diversity. In a Neolithic culture, a village culture—Micronesian society is a good example—there is no possibility of being different."

"I have wandered from the suburban forest. But not really. How we deal with this, what we make of it, depends on our ideas—and I suspect we shall have to study the ideas as well as the trees."

Further points of interest came up in the discussions:

Spurr. "A few years back at the Harvard Forest in central Massachusetts, we made a survey of why people bought and owned these lands. The results were surprising; many offered their land to the University so that the land would be taken off the tax list if a guarantee was given that it would be left as it was. In other words, almost everybody was owning it to maintain the status quo. Instead of getting back the questionnaire, we were offered thousands of acres of land."

Darling. "In England, there is an ancient forest called the New Forest where, believe it or not, Mesolithic man continues. He is a forest edge exploiter, bodging about, keeping a pig and an odd cow or two. These people are there yet. They don't farm well, and they have no intention of farming well."

Darling. "Lumber is not the primary crop, it is the secondary crop now. The primary crop is amenity. This is what the people in Connecticut are going to enjoy more than anything else in these forests. You have a secondary crop of lumber and a tertiary crop of game. Managing this floral and faunal complex comes down to just sheer planning."

Darling. "Corn yields have gone up because the agronomist knew he was to get more bushels per acre, and he did not worry about growing some rabbits and pheasants too. This might be a clue to the success of their method."

Darling. "We tend to think far too much of the visible flora and the visible fauna. The whole field of so-called wildlife management is crazy to neglect the invisible. They don't realize what they are dealing with. The inconsiderable, often unidentified creatures in the soil—the tyroglyphid mites that are running along the root systems of forest trees and things like that are important. Their job is the conversion of organic materials, and the fate of these inconsiderable creatures is important in managing forests."

Waggoner. "Of the 2 million acres of suburban forest in Connecticut, old fields represent an important part, 1 million acres, a third of Connecticut. These old fields have been out of cultivation for different periods of time. Let us consider a specific area of 100 acres made up of old fields last tilled 20 years ago. It grows red cedars, briars, and honeysuckle. You cannot walk across it as you will, but must follow rabbit paths. In one corner it is occasionally pastured or a farmer comes in August, mows some hay to take home. This is not a building lot. It seems impossible that there is so much of it, but there is. Someone is going to plan a use for this land. They are going to carry the plans out, or at least, they are going to start."

Went. "A great amount of the organic matter produced by forests is not harvested and it should be possible to harvest more material by developing an ecosystem clipper."

Waggoner. "Mr. Hicock and Mr. Olsen of this Station spent a great deal of time from 1940 to 1950 trying to find some marketable use for low-grade wood. They developed a charcoal kiln and a means of treating poles economically. If a large market for this could be found, the situation would be changed greatly."

Spurr. "We agree amenity values are important in Connecticut. But hardwood pulp also has real meaning for New England. I might illustrate this by what has happened over the last 10 years in Michigan. The regional pulp industry in Michigan, as in southern New England, had disappeared except for a few mills using imported pulp from Canada. With the development of new chemical processes and the need for insulating board, the hardwoods of Michigan are being used in new pulp facilities. The owners of the pulp mills moving into Michigan discovered immediately that they could not afford to buy any land because lawyers, doctors and auto mechanics like to own 40 acres and will pay $40 an acre for barren sand plain. Foresters were trained to help landowners prepare management plans for the land along the lines the landowners wanted. The forester's services are contributed free and the lumber is bought at the going market price to help pay taxes. This has been highly successful and it is a booming business in what is basically amenity forest."

Hicock. "Something similar could easily happen in Connecticut and perhaps in the not-too-distant future. Amenity may be uppermost now but the potential to produce 2 million tons of fiber annually, in perpetuity, and still have the amenities, should not be dismissed lightly."

The Lockwood Conference was very evidently a success! Seven months after it was over the New Haven Experiment Station published Bulletin 652 from which these brief excerpts have been taken. For it, the distinguished director of the Station, Dr. J. G. Horsfall, wrote a short foreword which among other things bore witness to some of the effects upon the station itself. In his final paragraphs were the following sentences: "The papers and discussions brought together in this volume suggest that there are no pat answers, no panaceas, applicable to the suburban forest, that there is a vast diversity of interests among those who live within the suburban forest.

"There seems to be, however, a preponderant opinion that experiments must be laid down to try a great variety of things. . . . Such work was in progress at this station. The Lockwood Conference, however, has already caused our scientists to begin even more studies of the ecology of the suburban forest. We expect it will open further vistas of research both here and elsewhere."

FIRST MONDAY LECTURE

Dr. Calaway H. Dodson, Taxonomist and Curator of Living Plants at Missouri Botanical Garden, will present an illustrated lecture on "Explorations for Orchids in Ecuador" at 8 P. M. Monday, November 4, in the Museum of Shaw's Garden, Tower Grove and Cleveland Avenues. This program, the only First Monday Lecture scheduled for fall and winter, is open to the public without charge. Coffee will be served at 7:30 and there will be opportunity to ask questions after the program.

EARLY FALL COLOR AS A DANGER SIGN

My boyhood was all spent in sugar maple country and from my earliest days I was accustomed to an occasional bright red or orange branch showing up in late summer on sugar maple trees. The colors were handsome and I took joy in them, little knowing what they meant. It was not until I was a graduate student that I learned that many of them, particularly in areas where sugar maples on the whole grow very well indeed, are the outward sign of a borer at work in the branch. Death is on the way and producing bright colors, just as in the autumn.

It is strange how quickly this knowledge altered my emotional response to these early splashes of autumnal color. No longer were they forerunners of our annual Eastern-American fall pageant. Without my thinking about it at all consciously, they had become symptoms of infection and disability. They were unsightly and unpleasant; they made the landscape less attractive. It was not until I got into an unexpected argument with an uninformed person that I realized how completely my own reactions to the sight of these branches had unconsciously reversed themselves.

In Saint Louis we are much more apt to notice general changes in the foliage affecting the whole tree, due to drought and heat. They, too, are danger signals and mean that a good long soaking is called for, one that will get down to the roots. By the time that most trees begin to look as if they were really drying up, it is too late to save them.

Edgar Anderson

TOWER GROVE HOUSE

NELL RIVES

The charm of Tower Grove House, built in 1849 by Henry Shaw for his country home, is in the elegant simplicity of the early Victorian period.

Since this was the heart of Mr. Shaw's estate where he planned and developed the Missouri Botanical Garden, it is fitting that Tower Grove should be preserved in a way that is a lasting tribute to him.

In the period from 1889, the year of Mr. Shaw's death, to 1912, Tower Grove was the residence of the Director of the Garden. During the next forty years it was used successively as headquarters for the Henry Shaw School of Gardening, classes for veterans following World War I, and as offices for the Garden staff.

In the meantime thought was being given to the restoration of the mansion, as it was frequently called. It was not however until 1953 that plans actually began to take shape under the leadership of Mrs. George H. Pring and Mrs. Arthur J. Krueger. Civic groups then became interested and were helpful in many ways. Days and weeks of hard work were put into the project. Layers of wall paper were removed, the first layer being carefully preserved as a sample for finding a reproduction. Plastering and other needed repairs were made. Windows were washed and floors cleaned. Furniture was polished, much of it Mr. Shaw's own, supplemented by gifts of the same period. Finally in November of that same year three rooms of the first floor were opened to visitors from 1 to 4 P. M. daily. Members of the Eighth District of the Missouri Federation of Women's Clubs served as hostesses.

One by one other rooms in this historic home were made ready to open. The task eventually grew to mammoth proportions and the project was turned over to the Historical Committee of the Garden for completion. More and more visitors were coming to Tower Grove. It seemed advisable to hold the house open for the full day rather than just a half day, and a paid hostess was in attendance each week day. The Federated Clubs continued to provide volunteers for the week ends, and to this day fifty-two clubs participate each year in this important hostessing project.

On November 16, 1959, the sixth anniversary of the opening of the Henry Shaw home, the Historical Committee gave a tea honoring Mrs. Pring and Mrs. Krueger, and the volunteers who had graced the Shaw House during the six year period. It was a gala affair.

The Historical Committee, with Mrs. Edwin R. Culver, Jr., and Mrs. Neal S. Wood as co-chairmen, have spent many long hours laboring over the restoration. The kitchen, the final room of this large house to be restored, was opened the spring of 1961. The interest of visitors runs high as they see the kitchen stove with herbs hanging behind it to dry, and the old fashioned cooking utensils, most of which are easily identified. The fluting irons bring forth more questions than any other one item in the kitchen.

The maintenance problem is always something to be reckoned with, with the modest admission charge to the mansion as the only source of revenue.

As attendance to the Garden increased following the opening of the Climatron, the attendance to Tower Grove House also increased. To take adequate care of the large number of visitors—more than 3,000 per month during the summer period—a new program for volunteers was inaugurated in May 1962. Two seminars were held for training hostess-guides with a total registration of 84 in attendance. These civic minded women from various organizations represented the Panhellenic Association of St. Louis, Women's Clubs, Teachers organizations, and other women interested in Shaw's Garden and the program of this historic home. These volunteers are on regular schedule, two or more each day to work with a paid hostess. Some come one day each week, others one day every two weeks. No one is scheduled who cannot serve at least once every four weeks. If a volunteer finds she cannot come on a regular schedule her name may go on a list of substitutes to be called on to serve for a vacationist, or in case of illness. The program is highly successful.

GIFT SHOP. Mrs. Culver and Mrs. Wood did not stop with the restoration of the Shaw House. In November 1962 with the cooperation of the Women's Committee of the Garden, the Tower Grove Gift Shop was opened on the second floor of the home. Under the skillful management of Mrs. Frank Vesser it is a successful venture. The Gift Shop is operated entirely by volunteers.

SHAW HOUSE COOKBOOK. Another major project launched March 1963 is the Shaw House Cookbook, edited by Marion O'Brien, food editor of the *St. Louis Globe Democrat*, and author of the Bible Cookbook and others. Food editors from coast to coast are reviewing this fascinating book in their columns. It is stocked in leading book stores in St. Louis, and mail orders are filled daily from the office maintained in Tower Grove House by the Historical Committee. The price is $3.50.

THE NUTMEG TREES AND THE COLONIAL ADMINISTRATOR

THE nutmeg seed is a botanical curiosity. The pulpy fruit splits open when it is ripe, revealing the large seed (the nutmeg of commerce) loosely wrapped in an attractive, bright grayish red, papery covering. This is what is technically known as an aril, an outgrowth from the point at which the seed is attached to the mother plant. Arils may in certain kinds of plants serve various purposes or apparently sometimes none at all. They may be fleshy and attractive to ants, so that the seeds get carried about and planted over a wide area. They may, as in sorrels, turn violently inside out as they dry, expelling the seed for a considerable distance from the seed pod.

Of all arils that of the nutmeg is one of the largest, brightest, and strangest. It is irregularly divided into narrow sinuous fingers which look almost as if they were clutching the seed. It is fragrant and very pungent to the taste, so much so, that it enters world trade as "mace" and one can buy it in the ground form at most supermarkets as well as at spice shops. Old-fashioned cooks prefer to have it freshly ground, though the unground arils are becoming increasingly difficult to come by.

Nuts and arils too imperfect for the spice trade are expressed under heat and the resulting oily mixture, "nutmeg butter," has been in the trade for centuries, being widely used in oriental medicines, in perfumery (particularly for perfuming high class soaps), and to a lesser extent in the production of liqueurs.

The Flora of Panama, published in parts by the Garden, in its most recent fascicle, included Dr. J. A. Duke's summary of the Nutmeg Family in Panama. Though neither the nutmeg, nor any of its closest relatives, are native to Panama, specimens had been collected from a genuine nutmeg tree

(Myristica fragrans) in the back country, growing as if wild. Dealing with this collection gave Dr. Duke the occasion to pass on the story of the colonial administrator in an area of commercial production of nutmeg and mace, who was ignorant of the basic botany of these products. He sent out a directive ordering "a speedup in the culture of nutmeg trees and a cutback in production for mace trees."

EDGAR ANDERSON

THE "GIRASOLE": IF YOU INSIST, "JERUSALEM ARTICHOKE"

THE early French Traders in America found the natives cultivating and using for food a small tuber, reddish in color and somewhat resembling a peanut. They took it back to France more than 300 years ago from whence it spread to England and to Italy. The Italians, as in the case of the Irish and the potato, named this plant. They called it a "Girasole" from the characteristic habit of all sunflowers, of which this is one, meaning "Turning to the Sun." This name was later corrupted to Jerusalem Artichoke—a name which has no connection with either the city of Jerusalem or the true globe artichoke with the exception that globe artichokes and girasoles belong to the same botanical family, the Compositae.

The girasole, *Helianthus tuberosus* L. is a native throughout eastern North America from Nova Scotia to Florida and as far west as Texas. It is now extensively cultivated in many places and specially on our west coast. This is tall, growing 6–12 feet, and a rather coarse typical sunflower. It may tend to become a weed if allowed to take over. The tuber of the native plant is small and warty and suitable mainly as hog or stock food.

The French immediately set about improving this plant and came up with the Improved Mammoth French White Jerusalem Artichoke.

The girasole is completely without starch. It stores its carbohydrates in the form of inulin rather than starch and its sugar as levulose, much in the manner as found in fruits. The caloric value is very low. Thus it is recommended in diets which restrict their starch and caloric intake. It is highly nutritional and a rather long neglected source of food.

The girasole or Jerusalem artichoke, if you must call it so, has a pleasant flavor and makes an interesting change from potatoes. The texture is more firm and the taste a bit sweeter. The tuber resembles a potato but is warty and knobby. It is a bit difficult to peel unless washed, scrubbed and cooked with the "jackets on." They can be prepared and used much in the same ways as potatoes even to a style of "potato chips." An ingenious cook will no doubt find a variety of ways to make this a new taste thrill and a welcome change on the menu.

E. L. EVINGER

Members' Preview Chrysanthemum Exhibition

Shaw's Garden

Sponsored by the Women's Association
for Friends of the Garden
Thursday evening
October 31, 1963
7 to 10 o'clock
Refreshments

Enter Main Gate

* * *

NEW MEMBERS OF THE FRIENDS OF THE GARDEN

AUGUST 1 THROUGH AUGUST 31

Mr. and Mrs. George Alles
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Mr. and Mrs. Rene J. Blaes
Mr. and Mrs. William F. Blecha
Mr. and Mrs. W. L. Burton
Capitol Hill Garden Club
Mr. and Mrs. Samuel C. Davis
Mrs. J. U. Gohn
Dr. and Mrs. Marcy Goldstein
Mrs. R. Kuhn
Mr. and Mrs. R. W. Scheuermann
Miss Carol Jayne Schlattmann
Mr. and Mrs. Eugene B. Schmid
Miss Emma Setzer
Mr. Herbert G. Smith
Miss Audrae Stevens

* * *

SATURDAY MORNING NATURAL SCIENCE PROGRAMS FOR CHILDREN

Time:	10:00 to 11:30 A. M.
Place:	Shaw's Garden—Museum Building or Research Greenhouse.
November 2	"Nature Movies." Three color-sound movie films will be shown.
November 9	"Bird Feeders." Children will make simple bird feeders. Each child is to bring an empty half-gallon milk carton.
November 16	"Soil and Water Conservation." A study of soils and erosion, watersheds and forests, and the dangers of water pollution.
November 23	"Fun with Fruit." An interesting session in identifying a variety of fruits. Simple prizes for those identifying the most.
November 30	"Deserts." A study of the deserts of North America and the plants that live in them.
December 7	"Insectivorous Plants." Demonstrations and study of the weird plants that digest insects.
December 14	"Christmas Program." Children will make decorations to take home for the Christmas tree from seeds, seed pods, cones, etc.
December 21	"Christmas Decorations." Children will make Christmas wreaths. Each child will take home a wreath.
December 28	"Nature Films." A selection of the newest and best color sound films.

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MISSOURI BOTANICAL GARDEN

Bulletin

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COVER: A Missouri clump of Indian Pipe in full flower. Note the dense mass at the base where the branching roots, the well-rotted leaf-mould and the fungi which sheathe the rootlets are all interwoven.

PHOTOGRAPH BY PAUL A. KOHL

CONTENTS

Indian Pipes

A Trip to Tulcan

Why Should Victoria Leaves Be Stiff?

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: EDGAR ANDERSON

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Missouri Botanical Garden Bulletin

Vol. LI No. 9 November 1963

INDIAN PIPES

During the third week in August, a fine specimen of the beautiful INDIAN PIPE, *Monotropa uniflora,* was brought to the Garden for identification. This ghostly plant, which looks precisely as if it were made out of white candle wax, comes from the woodlands with rich deposits of leaf mould in which the plant gets started and from which is drawn its nourishment. It is a true flowering plant; each stem is tipped with a flower somewhat the shape of an old-fashioned clay pipe but a good deal smaller and whiter. By looking closely we can see the yellow of the stamens glowing through the delicate tissues of the flower. If it flowers at all there is usually a clump of these blossoms coming up from the same root to the height of six inches or so. Their leaves and the petals of the flowers are white translucent scales, unless they are bruised, when they darken to jet black in a few hours. They are so different in substance from anything else one finds in the woods that country children are sometimes afraid even to touch them.

Unlike some other colorless flowering plants, they are not parasites. If the mass of branching roots from which the flowers arise is carefully examined each root will be found to be tightly sheathed with fungi. It is the delicate filaments of these fungi which digest food out of the surrounding leaf mould and pass much of it on to the plant. Many fungi are very specialized chemists. This union of root and fungi is called a mycorrhiza, merely a distinguished way of saying "fungus-root" in Greek. It was in a European species of Monotropa that such fungi were first discovered in 1832. Sometimes, as in Indian Pipe, the fungal zone is on the outside of the root, a thickly interwoven sheath of filaments. Sometimes it is deep within the tissues of the root.

In mycorrhizae the root and the fungus have gone into partnership; it it true symbiosis. They are very different kinds of organisms but each needs the other. Mycorrhizae are common in forest trees. They reach the peak of their evolutionary development in Indian Pipe where they take over the entire nourishment of the plant.

The gentleman who brought in the specimen was hoping to transplant the clump to his garden. We had to tell him that this was apparently impossible. In the North where Indian Pipes are far more common than they are here, this has often been attempted but never successfully as far as we know. It may well be that having to transplant both the living root and the living fungus is what makes the operation so difficult. Few gardeners have ever attempted to make a fungus happy in a new situation.

As it ages, the Indian Pipe darkens. In cool weather this takes place slowly enough so that one can watch it change from white to pale buff pink, which deepens into jet black. In the summertime in Missouri these pink stages are rare; one finds the blackening edges of the scale-like leaves on a pure white plant. There is a Mexican variety however in which the color is red.

As they go to seed the Indian Pipes change rapidly. The flowers point straight up in the air. The plants dry up, losing all their waxy texture. The color, becomes a dirty, nondescript brown. Even when there are good seeds in the terminal capsules the plants soon look like something weathered and dead; as if they had been left over from last year.

Nearly a half century ago Professor W. J. V. Osterhout of Harvard used the darkening tissues of Indian Pipes to find out how this change was proceeding in the tissues of the plant. He took a fragment of leaf and studied the cells, mounted in water, under the microscope. The cytoplasm of the cells was transparent and nearly colorless with a few visible granules here and there; the cell nuclei were a little more granular looking but practically without color. It is protoplasm, the essence of living matter, one is examining at such times but there is seldom much to be learned by direct observation. In the Indian Pipe the plant itself could tell us a little. Osterhout cut or crushed leaves and placed them under the microscope. Within five or ten minutes the nuclei of the cells were more densely granular and began to darken. The darkening did not begin just at the edge but all through the whole nuclear mass. Not until the nucleus had become very dark, sometimes a matter of hours, did any change of color appear in the cytoplasm. He tied these observations up with chemical experiments on the dye itself. In his hands these charming plants became a new avenue for finding out a little something more definite about the action of living cells.

E.A., G.H.P.

INTRODUCTION

ONE of the most important products of the Missouri Botanical Garden is the young people who work and study here. Such are the Student Apprentices who help Mr. Kenneth Peck with the Summer Program of Nature Study. Such are the undergraduate and graduate students from Washington University who assist in the Herbarium and the Library and carry on graduate work. Two decades ago, outstanding among these young people was Charles B. Heiser, Jr., of St. Louis and Belleville. He received his Master's degree from the Henry Shaw School of Botany and went to the University of California at Berkeley for his Doctorate. Now Professor of Botany at Indiana University, he last year worked in Ecuador, continuing some of the studies of wild and cultivated plants which he began at the Garden and at Berkeley. In the accompanying article he gives us an informal account of an excursion to a border town in the highlands. E.A.

A TRIP TO TULCAN

CHARLES B. HEISER, JR.
Indiana University

A YEAR ago when I visited Ecuador my friend Ing.* Jaime Díaz went out of his way to show me as much of his country as possible, and he felt that my trip would not be complete without seeing the *frailejón* which grows only in the high, cold *páramos* of northern Ecuador. The *frailejón, Espeletia hartwegiana,* a member of the compositæ family, reaches heights of five to eight feet. The flower is not particularly colorful but the large crown of grayish-white leaves is striking. The sight of thousands upon thousands of plants was certainly one of the most remarkable ones that I saw in the entire country. The crushed leaves of the plant have a strong camphor-like odor, and it was not surprising to learn that the natives employ them as a cure for rheumatism. *Espeletia hartwegiana* also occurs in Colombia, and other species of the genus are found there and in Venezuela. My pictures do not do justice to the plants for two reasons—I had lost the camera which I used for black and white photographs and had to take kodachromes, and it was raining the entire time we were in the *páramos.*

Leaving the *páramos* of El Angel, we drove on to Tulcan to spend the night. Tulcan is located on the border with Colombia and Jaime told me that it wasn't one of the more beautiful cities in Ecuador since the people there spend all their time in smuggling. Jaime is known to exaggerate at times, but he was certainly right as to the appearance of the place. Not only was the atmosphere rather depressing but it was cold as well. Although it is situated at an altitude of 9100 feet, slightly lower than Quito, I never found the latter city quite so cold. The best hotel was fully occupied so we had to spend the night at the second best which only added to our discomfort.

The next morning, Jaime said that there was one place in Tulcan worth seeing—the graveyard. This sounded strange but it was true, for the topiary work with the cypress at the cemetery was indeed impressive. I didn't learn the name of the species but it is an introduced one since none occurs naturally in Ecuador. Nor do I recall the name of the artist, although I understand that he had never received any special training and that with his crew of Indians he managed to keep the shrubs in beautiful shape the year around.

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*In Latin America those with training in Applied Science bear the title of Engineer (*Ingeniero*).

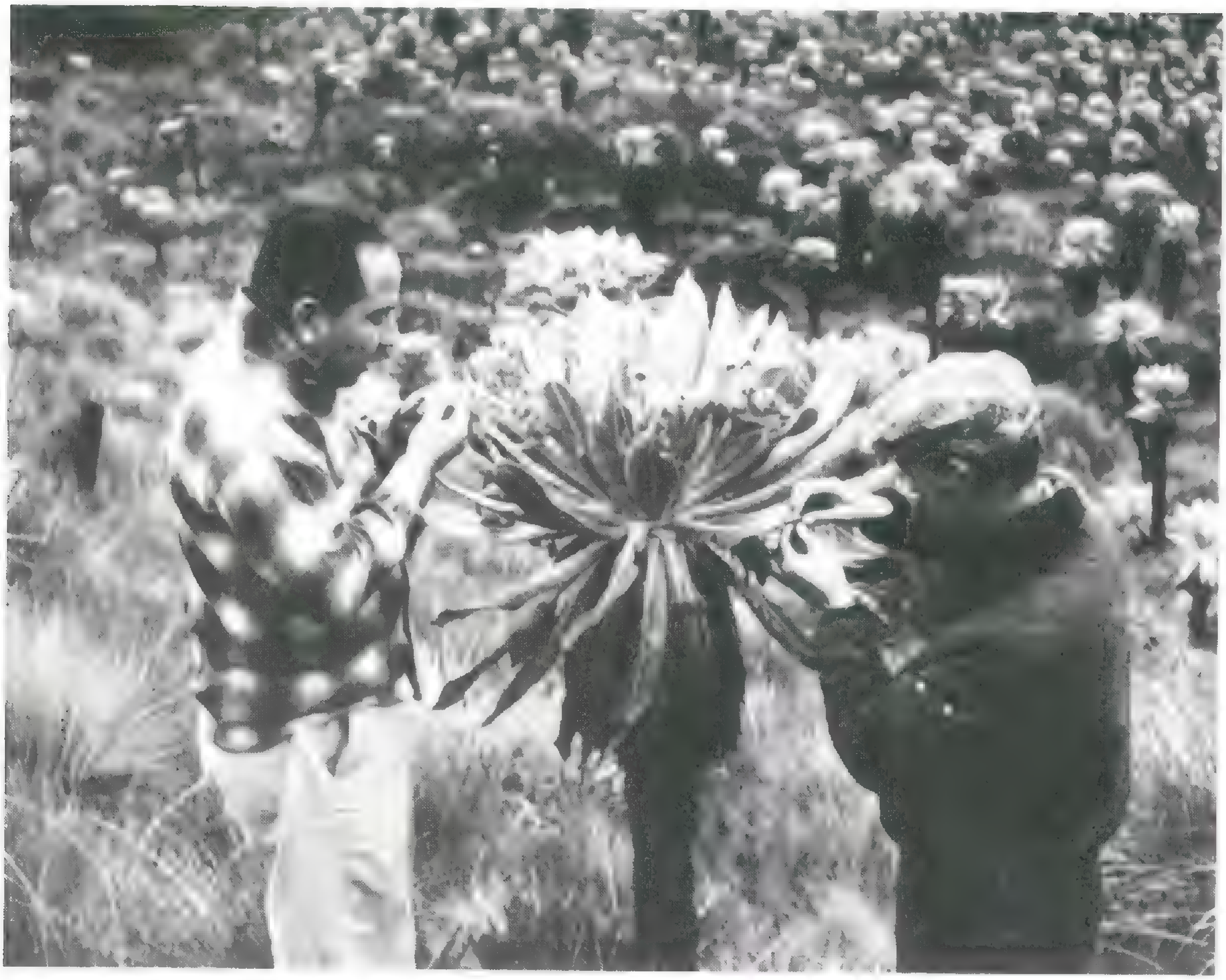


Fig. 1. Ing. Jaime Díaz and his assistant examining a frailejón in the *páramo* of El Angel.

Some of the world's weirdest landscapes are known in the northern Andes as *páramos.* There they form vast rolling plateaus above treeline at roughly 10,000 feet in Venezuela, Colombia, and Ecuador. They are wet grasslands, mostly big bunch grasses, and in between them, low wooly rosette plants, cushion-like plants, and an occasional shrub. Fog and rain are to be expected pretty much throughout the year. You start a picnic lunch in warm sunshine and before you have half way finished eating, the fog has blown in and your teeth are chattering. What is essentially the same type of vegetation is found as far south as central Peru, though known there by other names. Still farther south grassy plateaus continue along the mountains but they are drier and differ in the character of the landscape.

In the *páramo* vegetation, evolution has gone off on a side track and produced some of the world's most curious plants. One whole genus, Espeletia, is limited to this region and some of the species are variable and hard to

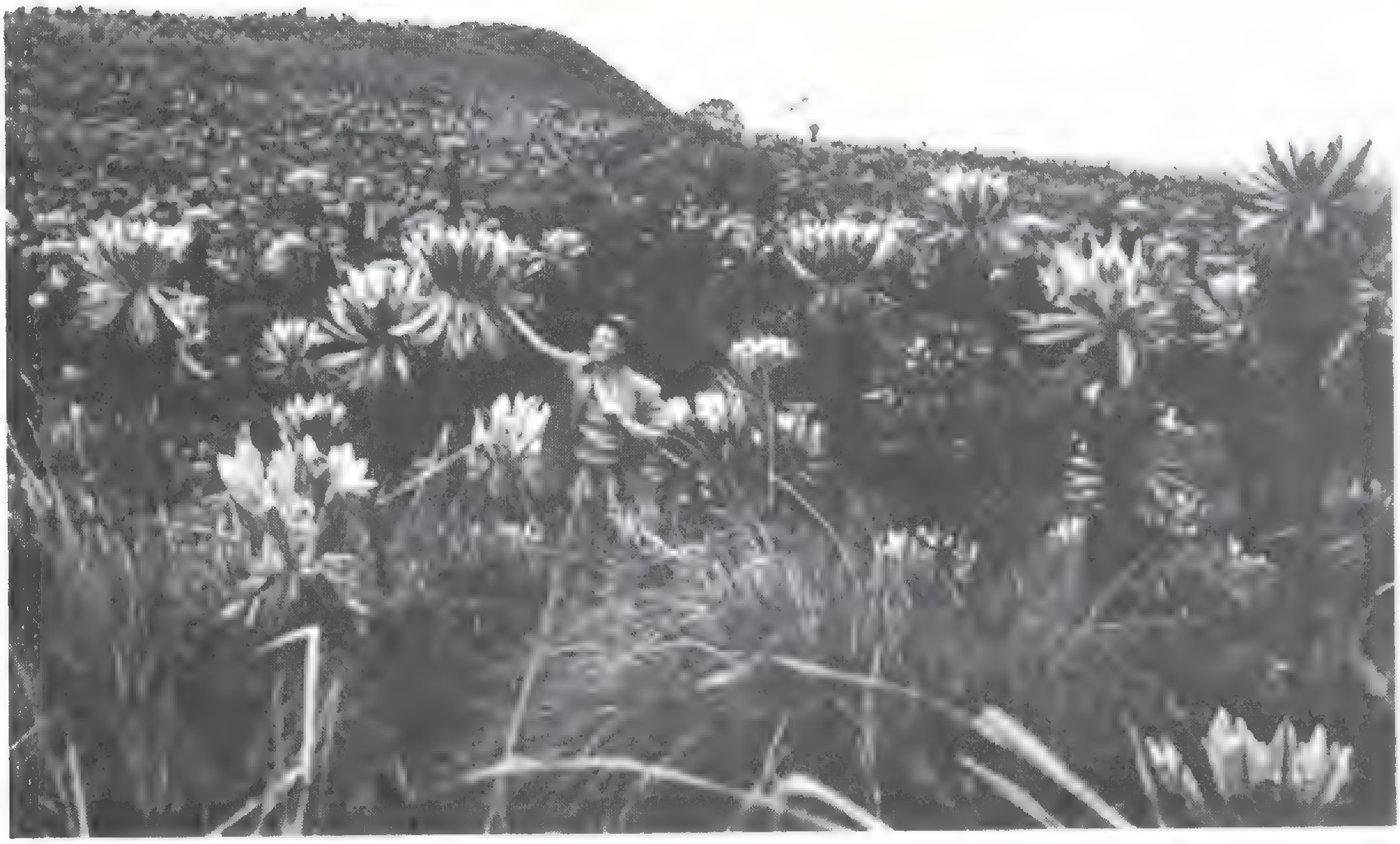


Fig. 2. The author.

classify. Many of them look like a rosette of wooly leaves on a tall post; it is hard to believe that they are closely related to sunflowers. If, however, you examine the terminal topknot as Señor Diaz and his assistant are doing in figure 1, you will find that it looks like a beautifully arranged bouquet of little branching stems of small sunflowers and large decorative leaves of some celestial mullein.

Many of the Espeletias are taller than they look until you start to study them. Dr. Heiser is over six feet tall and in the center of figure 2 you will note that he is having to reach way up to pick a flower. In shifting fog and mist these stands of Espeletias seem like strange beings from another world. As you walk along and the fog comes and goes, your own movement of course changes their positions relative to each other. At such times it seems as if they too were moving; to one who is lost on the *páramo* they must be terrifying.

E.A.

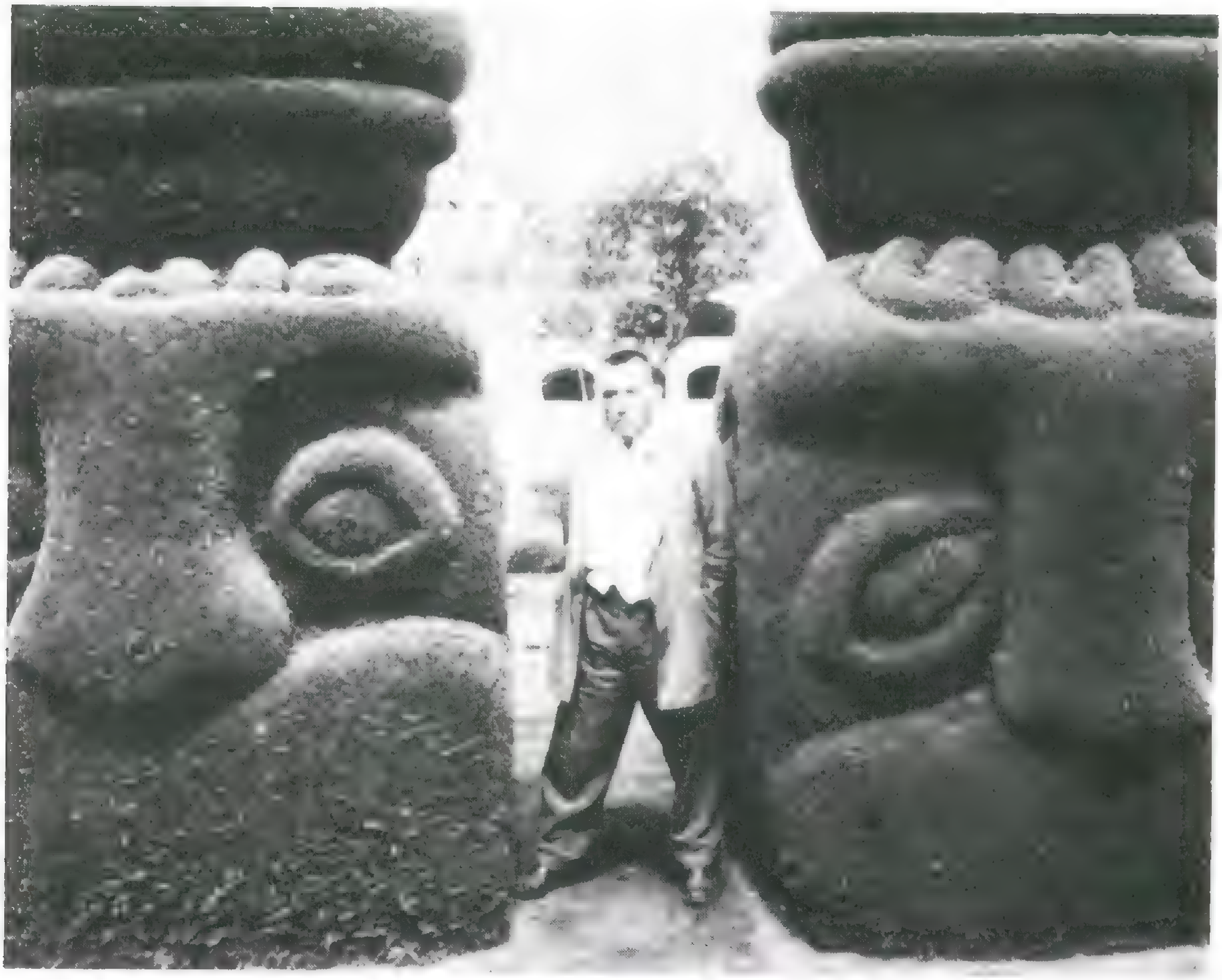


Fig. 3. The artist and two of his creations.

Dr. Heiser's pictures of the cemetery at Tulcan, Ecuador, are the most extreme example of topiary work (the clipping of shrubs and trees into other shapes for decorative purposes) that I have seen from anywhere in the New World. The scale of the work is evident only in figure 3. Note that the same two figures (smiling like the mask of comedy at the left, frowning at the right) are in the center of figure 4. The arches in figures 5 and 6 are high gateways. All of the rows of darkish objects in the four figures are clipped cypress; only a few in figures 5 and 6 are in need of shearing.

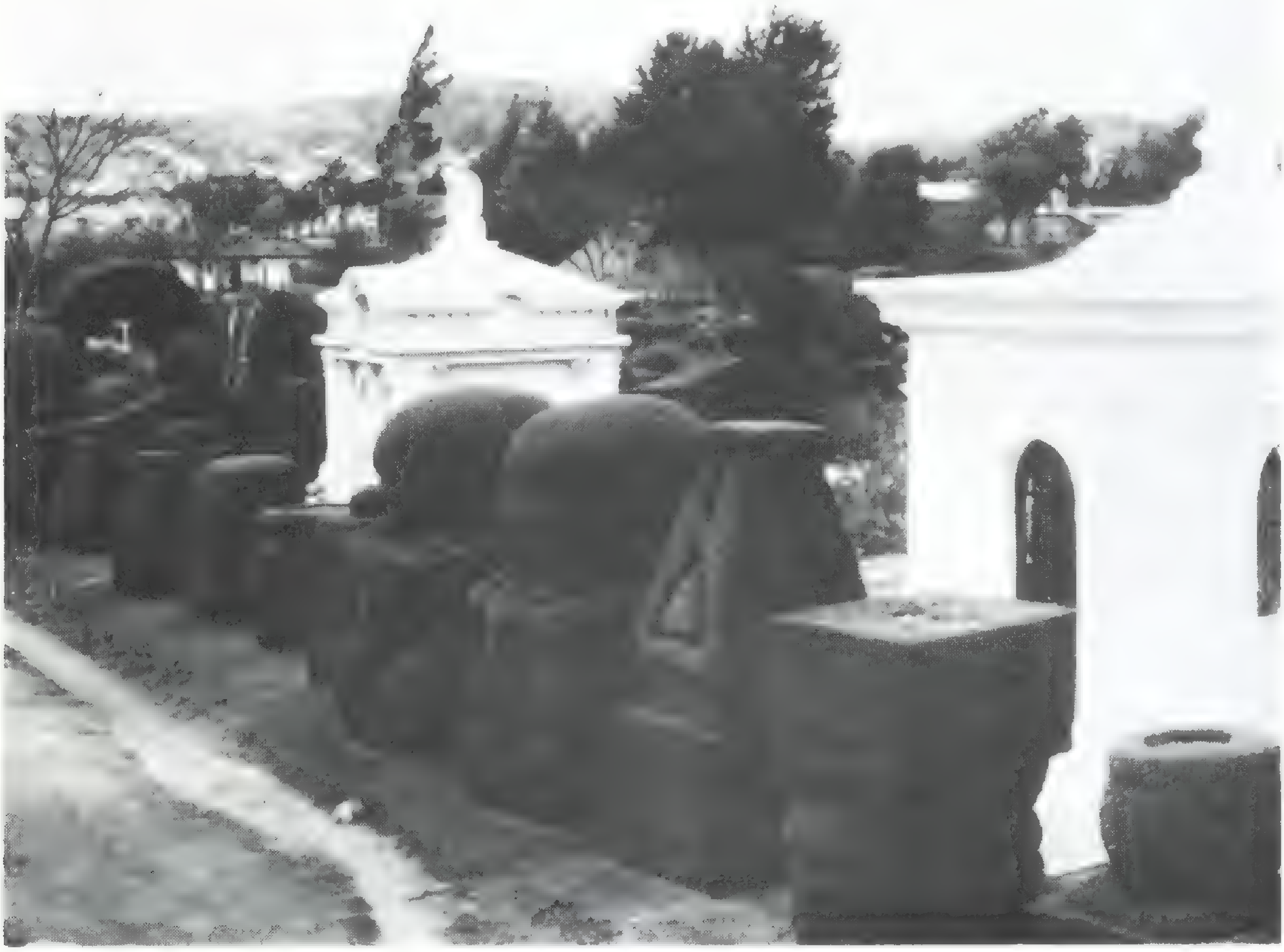
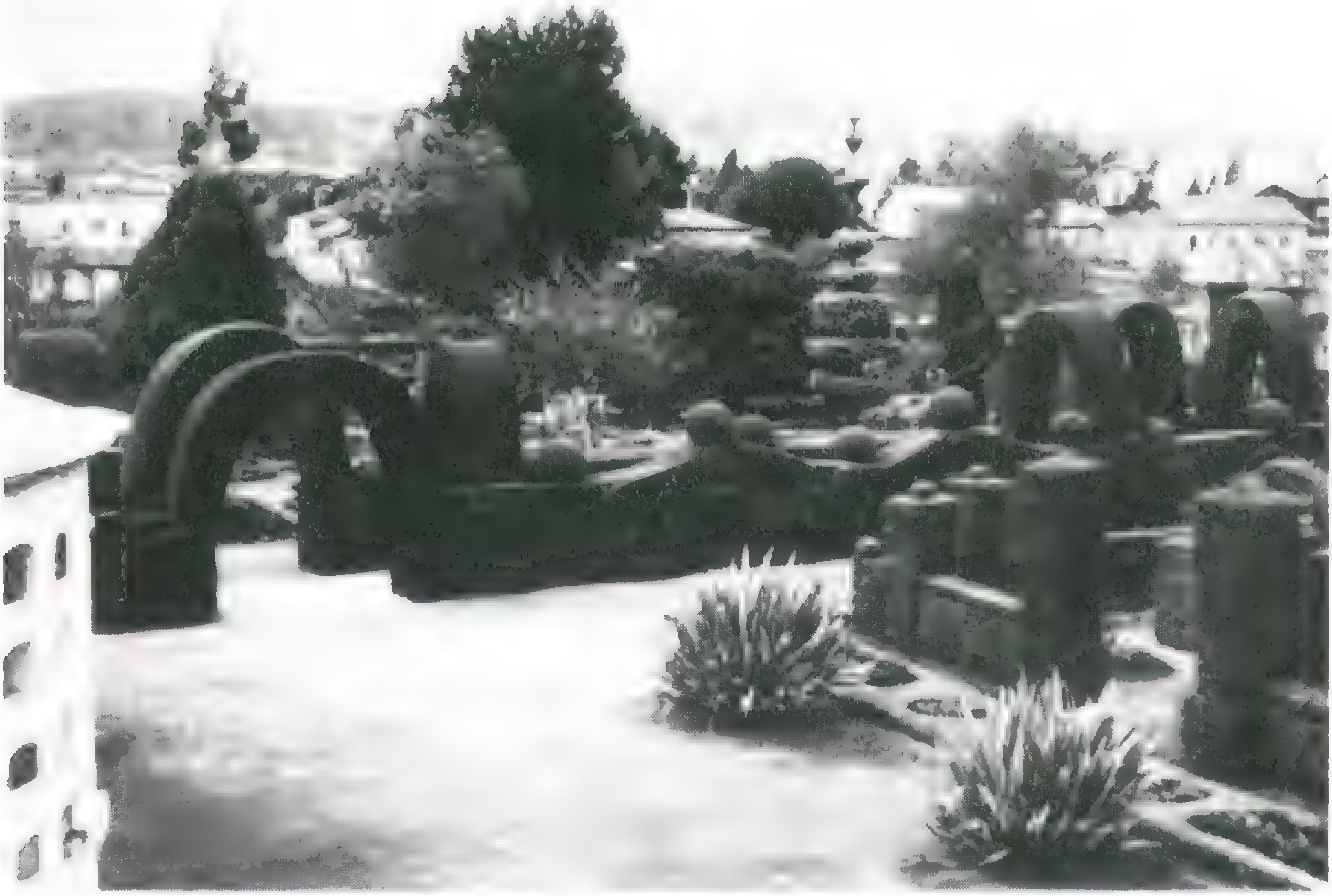


Fig. 4. The masterpieces of fig. 3 are in the center.

Topiary work, which we see so little of in this country, started apparently with the Romans; the younger Pliny described examples of it at great length. It passed on into Italian gardening and spread to Portugal, Spain, Holland and England. There were bursts of it, with landscape experts both for and against it, in Elizabethan and in Victorian England. In the United States, with labor so expensive, even simple hedges are relatively rare and are greatly missed by homesick Europeans.

E.A.



Figs. 5, 6. Scenes in the cemetery at Tulcan, Ecuador.

Though topiary work as extreme as this has flourished at times in the English-speaking world, the standards of public taste have always set in against it. A few great English writers scoffed, just a little, and their words keep turning up from century to century. Bacon wrote in his essay on gardens: "For the ordering of the ground within the great hedge, I leave it to the variety of device; advising nevertheless, that whatever form you cast it into, first it be not too busy or full of work. Wherein I, for my part, do not like images cut out in juniper, or other garden stuff—they be for children. Little low hedges, round like welts, with some pretty pyramids, I

like well, and in some places fair columns upon frames of carpenters' work."

Long after Bacon's time, Addison wrote in the *Spectator*: "Our British gardeners instead of humoring Nature, love to deviate from it as much as possible. Our trees rise in cones, globes, and Pyramids. We see the marks of the scissars upon every Plant and Bush. I do not know whether I am singular in my Opinion, but, for my own part, I would rather look upon a tree in all its Luxuriancy and Diffusion of Boughs and Branches, than when it is thus cut and trimmed into a Mathematical figure."

E.A.

WHY SHOULD VICTORIA LEAVES BE STIFF?

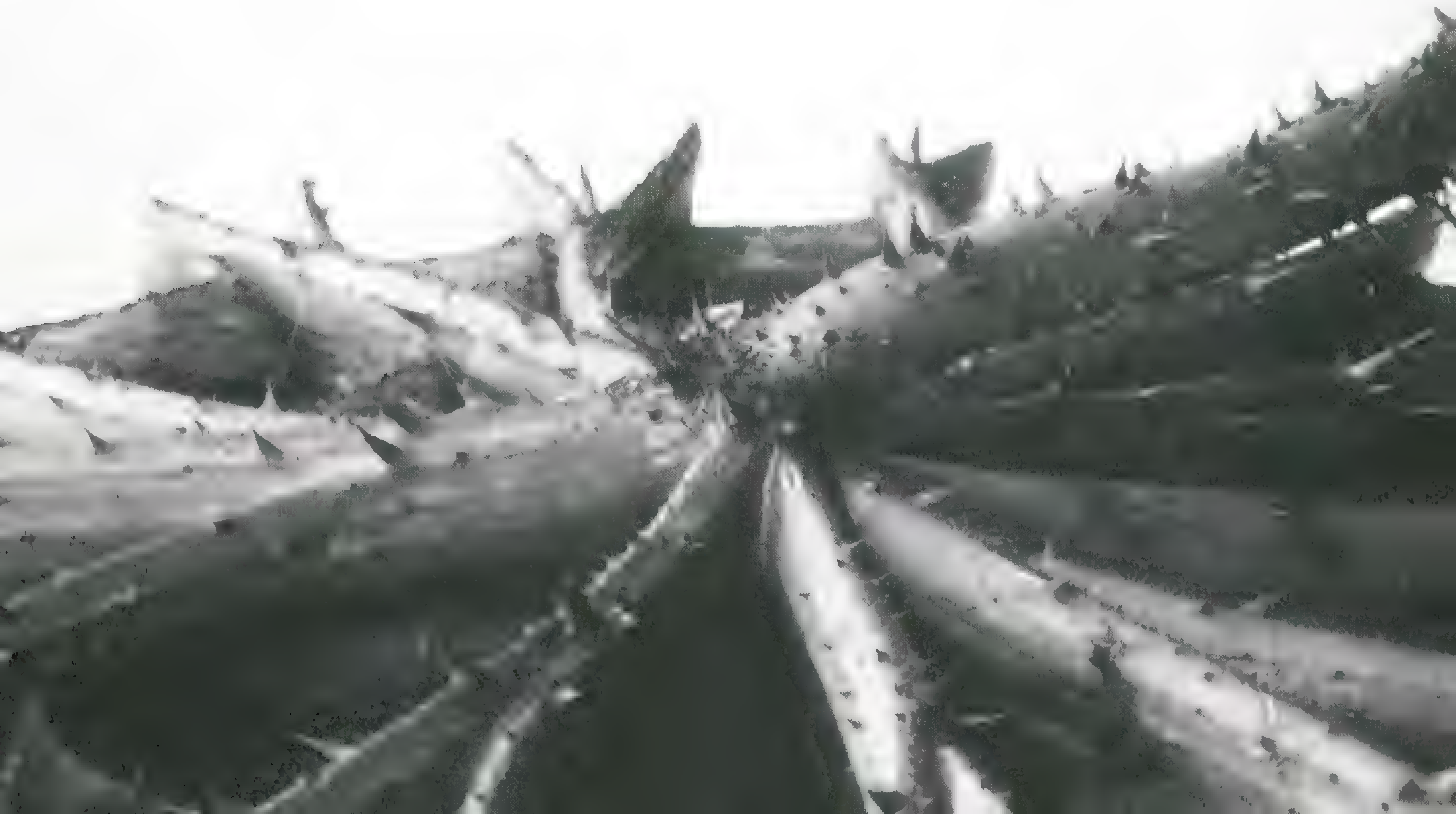
For most of our summer visitors one of the outstanding sights at the Garden is the big flat leaves of our Victoria water lilies* with their prominent up-turned edges. Particularly fortunate are those visitors who arrive when the old leaves are being removed and there is a chance to examine the strange architectural design of their lower surfaces. The framework of the veins is not quite circular, as it seemed before we turned it over. There is one main axis. Viewed along it, the right and left sides are like mirror images. The main veins radiate from a point a little off of center, along this axis, where the leaf stalk joins the lily pad. In a moderate-sized leaf there will be something like six or eight veins in the center and they stretch out toward the margin, forking as they go, in a fairly regular pattern. By the time the leaf's erect rim is reached there will be around ninety, each tapering gently from the center to the rim.

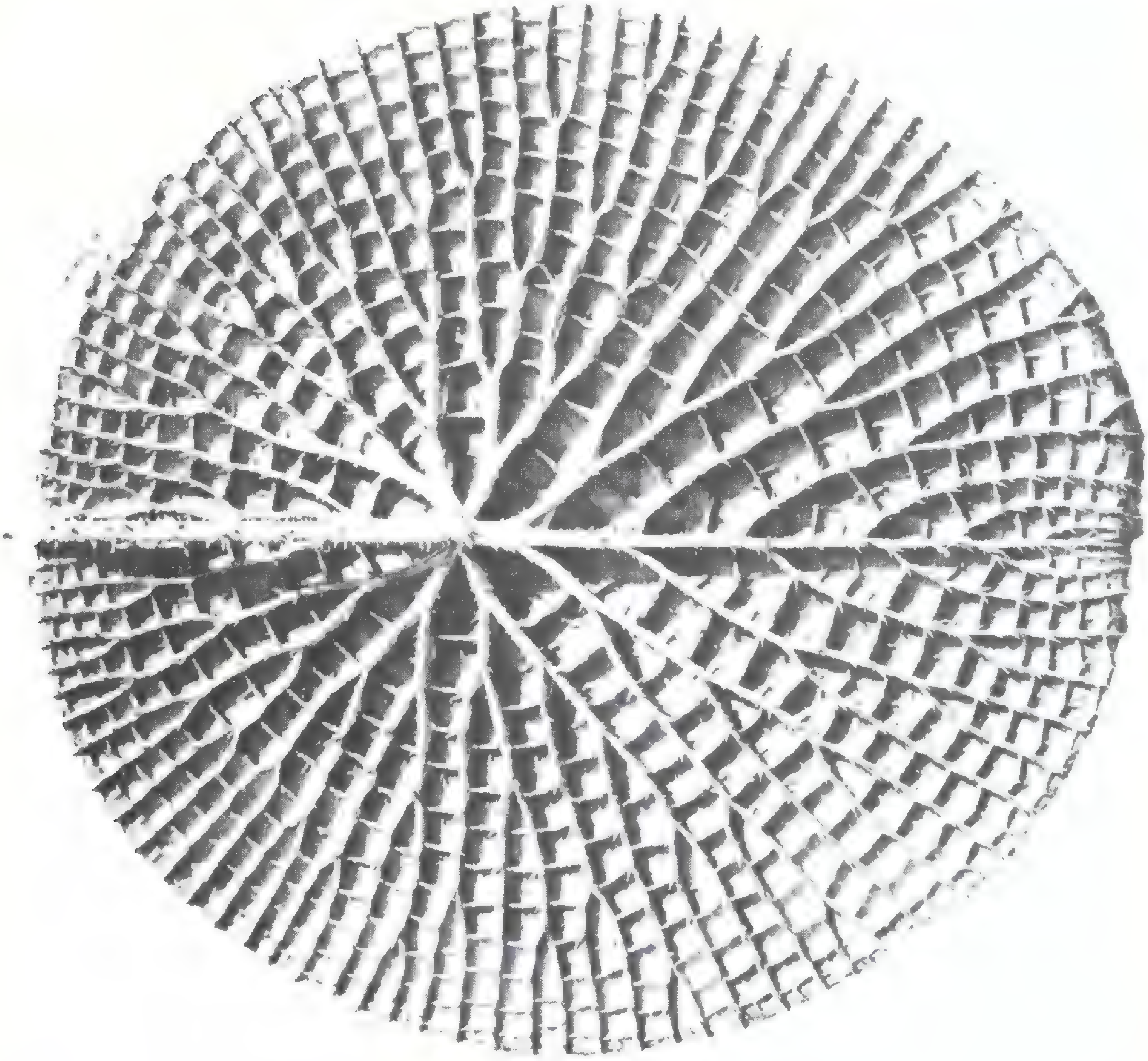
In contrast, the side veins make a pattern all their own. They are thin webbings passing from one vein to the next, nearly as thick at the edge of the leaf as near the center, but only a fraction of the height. They occur regularly enough so that the whole leaf becomes a pattern of radiating spokes and delicate concentric circles, at right angles to them.

Victoria cruziana, and *Victoria regia* hybrids

Central portion of a Victoria leaf cut out and seen from below. Note the high narrow veins which have been sliced through (just beyond their point of branching) along the upper edge of the picture. Note also the side vein at the lower left, like a thin web between the main veins.

PHOTOGRAPH BY PAUL A. KOHL





A large leaf of *Victoria cruziana* seen from the lower side. The stem enters from the left.
PHOTOGRAPH BY PAUL A. KOHI

The strangest feature of the veins shows immediately to the naked eye but is difficult to catch with the camera. The veins are flat, strikingly so, and meet the surface of the leaf *not along their sides but their edges.* On the leaf in the photograph, toward the center they were two inches deep but only half an inch wide. That is, they were flat narrow ridges four times as high as wide, standing out at right angles to the leaf's surfaces. The side veins in that same area were as thin as a maple leaf but nearly as high off the leaf as the main veins.

The leaves are known to be strong. Careful tests made with sand have shown that a mature leaf can carry over 300 pounds of sand before collapsing. Some years ago I became intrigued with the design and carried photographs and samples to Dr. Alexander F. Langsdorf of the Engineering School at Washington University. He had great respect for the design. It was "an almost perfect solution for the problem of stiffening a circular flat plate supported near the middle." The veins, said he, were more efficient if flat, since the end-to-end stiffness of a supporting vein would be proportional to the cube of the vein's height but only directly proportional to its width. In other words a vein three times as wide would give merely three times the stiffening but if it were three times as high off the leaf it would stiffen twenty-seven times as much.

Dr. Langsdorf then proceeded to illustrate these and other principles of the design from illustrations of various kinds of machinery; I remember in particular a series of boilers with circular plates at their ends. Between one machine and another he could show mechanical parallels of most of the water lily design. All except the defenses against hungry animal-life. No boilers had ever been equipped with spines to prevent their being eaten.

Immediately however he had a question for me: "Why should water lily leaves be stiff? How is it, in any important way, advantageous to the plant?" I had no answer for him that day. The question puzzled me a great deal. It still does.

There are other kinds of water lilies with large leaves. They are all moderately flexible though they lie flat on the water. A successful water lily does not *have* to be shaped like a Victoria.

Has it perhaps anything to do with that other peculiar feature of the Victoria, the rim which stands up around the edge of the leaf? The Victoria leaf is not only stiff; it is essentially a stiff flat basin. Is there any way in which a stiff basin-like leaf might serve a plant in tropical waters, serve it well enough so that the course of evolution would be pushed in that direction?

Watching the Victorias in the pools at the Garden, they seem to serve as more efficient landing platforms for birds, than do the other water lilies. In what ways might the lilies be helped by bird visitors? One can mention a couple possibilities but neither is very convincing. It might be that some serious pest of the lilies such as insects or snails is kept under control by certain birds and these are attracted. It might even be that the Victorias, which are heavy feeders, can even profit from the bird droppings in some way.

The question has been put to a good many naturalists and none have come up with even this much of an answer. Yet the leaves of Victoria are so exaggeratedly specialized, the dynamics of their strange veination points so directed at efficient stiffening that one keeps feeling there must be an answer.

EDGAR ANDERSON

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Bulletin

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COVER: Close-up of a flowering branch from a Scholars' Tree *(Sophora japonica)* in late summer. Note how all the branches have shed their blossoms at the base and have new buds still coming at the tip. This tree is not only a summer bloomer but stays in flower for some weeks.

PHOTO BY SHAW CAMERA SHOP

CONTENTS

Sophora japonica, Japanese Pagoda-Tree, Chinese Scholar-Tree

A Jujube Tree in the Older Part of St. Louis

The True _Salvia coccinea_, Indian Fire

How to Reach the Garden by Auto

Pitzman Summer Nature Program

Friends of the Garden Picnic

New Members of the Friends of the Garden

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden
Vol. LI No. 10 Bulletin December 1963

SOPHORA JAPONICA

JAPANESE PAGODA-TREE, CHINESE SCHOLAR-TREE

With many exotic trees we have the problem that there is no good common name which has become current in English. For this oriental Sophora either of these names would serve and yet neither one has really caught on and become in truth "common." No visitor to the Garden has ever come up to me asking for "the Japanese Pagoda-Tree" or the "Chinese Scholar-Tree" and wanting to be directed thereto. Either name would answer the purpose, though neither is completely appropriate. Though *Sophora japonica* is very common in Japan it is *not* native there and a very different kind of tree (Terminalia) is widely known in the tropics as "pagoda tree." According to Li it was *not* this tree which was recommended for the graves of Chinese scholars but the Goldenrain-Tree, *Koelreuteria paniculata.* According to him *Sophora japonica* had through long tradition become established as the official memorial tree for *higher* officials, with pines for kings, arborvitae for princes and poplars for the common people. All of this, mind you, as early as the Chou dynasty (1122–340 B. C.). As a result it has been very widely planted all across China and is common from Peiping in the North to Hong Kong in the South.

The Garden's largest specimen is immediately upon Tower Grove Avenue just north of the Administration Building. It did well there for many years though it leaned out almost too picturesquely over the street. In the last two decades it has become increasingly hampered by other nearby trees, particularly the vigorous Pin Oaks planted along Tower Grove Avenue. In the spring of 1963 several dead branches appeared in the crown, probably more the result of this competition than of the difficult weather of the previous winter with its sudden extremes of heat and cold. Other specimens of this species in the Garden's collections were not injured, though they too are somewhat crowded.

There is a fine tree just north of the Experimental Greenhouse; a pair of vigorous young ones are north of the Mausoleum Grove where Henry Shaw is buried. As you come out of the Grove one leans out at the left just reaching the edge of the curving walk which leads to the Climatron; the other is farther to the right, close to the walk and flanked north and south by large Ginkgo trees.

The foliage of *Sophora japonica* is outstanding. The ultimate leaflets are one to two inches long, a smooth dark green above, a dark gray-green below. They are rounded at the base and taper gently to an acute point terminated with a minute bristle. In the hand or on the tree they have a formal look. This is enhanced by their being of good substance, slightly shiny above, and nicely spaced over the whole crown of the tree.

The leaflets are aggregated in compound leaves of nine to fifteen leaflets. They are set in pairs along the central rachis, opposite each other, or nearly so, with a single terminal leaflet at the very apex.

At the base of each leaflet and of the rachis itself are the curious little organs known as *pulvini* (singular, *pulvinus*) which indicate that the Japanese Pagoda-Tree belongs to the Leguminosae, the same family of plants as do beans, clovers, and wisterias. The *pulvini* show most clearly on the under sides of the leaves. They are little shiny, dark green, slightly swollen cylinders, sensitive valves regulating the drooping and expansion of the leaflets. Sophora leaflets fold up every night, just as clover leaves do, and if you have never observed it, seeing it for the first time, brightly illuminated by the headlights of your car, it can be quite a shock. It looks almost as if the whole tree had suddenly wilted. The first reference to the phenomenon in any plant is in an old Chinese book of the 12th century B. C. in its discussion of *Sophora japonica*.

To a casual glance the mature leaflets appear to be without hairs, either above or below. With a hand lens or reading glass they can nearly always be found on the underside, particularly where the *pulvinus* joins the leaflet. Once you know they are there and just how they are arranged, your mind organizes what your eyes took in and you begin to wonder how you missed them before. You then see them quite distinctly.

In making sure of the identity of small trees it may be helpful to know that *Sophora japonica* does not ordinarily have a true terminal bud. When growth starts in the spring it comes out from a lateral bud leaving a short dead stub which falls off after a few years. After you have noticed them a few times these little gray stubs become characteristic of twigs of *Sophora japonica.*

The outstanding feature of the Japanese Pagoda-Tree is its flowers. They occur in showy creamy-white clusters all over the tops and the sides of the tree. The individual flowers are small, about the size of the end of your little finger, but they are profusely borne in upright bunches over a foot across, whose slender stiff branches are bright green. The flowers are something like small, less ruffled sweet peas. Though I have kept no precise notes, they apparently stay in bloom longer when, as in the summer of 1963, their blooming period is somewhat interrupted by weeks without rain. Under these conditions they had flowers from July well into September.

In China the dried flowers have been used extensively as a dye, particularly to produce a green color on blue

Scholars' Tree in full bloom in midsummer.

PHOTO BY E. L. EVINGER

cloth. As late as the early nineteenth century they were still being exported to Europe for such purposes. If the flowers fall on a cement sidewalk and are rained on and tread upon they produce an unsightly and persistent dark stain.

Bright yellow flowers are said to be characteristic of trees in Peiping and varieties whose flowers are marked with purple have been described.

Towards the end of their flowering period, the flowers set seed and develop rapidly into narrow little pods about five inches long. The pods swell only immediately around each bean and are very narrow in between the beans so that as they ripen they look like short strings of green beads. They are not particularly unsightly when they fall on the grass but on a sidewalk or pavement they can be quite messy looking.

In this country *Sophora japonica* is not attacked by insect pests or plant diseases and its foliage stays a clean dark green in spite of hot suns and high winds. There seems to be no reason why it should not be more frequently planted in and around St. Louis.

The genus Sophora is made up of around twenty species of trees and shrubs mostly native to warm temperate and sub-tropical regions. Of those native to the United States, the mescal bean, *Sophora secundiflora*, is the most widely known. It extends from New Mexico and Mexico, eastward and northward to central Texas. There, in defiance of eastern usage of the same name, it is known as "Mountain Laurel." It is a shrub or tree with handsome evergreen leaves and violet-blue flowers. On first meeting with this other Sophora it is something of a surprise to find them both in the same genus but a little reflection shows that they have much in common. They have the same fundamental leaf pattern. *Sophora japonica* does contain a dye even if the blue color only shows in certain rare varieties. The mescal bean looks like beads on a string when it goes to seed, though not such elegant spherical beads as in the pod of the Japanese Pagoda Tree. And while the mescal bean does have truly evergreen leaves those of the other species are of heavy substance and hold their green late in the autumn as if they too were trying to be evergreen.

EDGAR ANDERSON

A young Scholars' Tree in midsummer, just north of the Mausoleum.

PHOTO BY E. L. EVINGER

A JUJUBE TREE IN THE OLDER PART OF ST. LOUIS

By bringing in a specimen for identification, Mr. William A. McCluskey has called our attention to a hardy jujube (pronounced jew′-jewb) tree in the older part of St. Louis. It is at the Little Flower Convalescent Home, 2500 South 18th Street, on the south side of the building and is over thirty feet tall.

Most varieties of the jujube *(Ziziphus jujuba)* are not hardy outside the sub-tropics but it is grown over a vast area from the eastern Mediterranean to China and some varieties are much hardier than others. Even those who have attempted to plant hardy varieties in St. Louis have usually lost them after a few winters. The Home was formerly a convent; the wide contacts of the Order would have made it possible to have introduced this tree from a variety of places.

The specimen at the Home seems to be in good health and bore a few fruits this year. The one which was brought to the Garden looked very much like a tough-skinned date. Between the skin and the heavy central seed there was not very much edible flesh but what there was tasted something like a high quality dried apple and something like a baked apple. It was similar to the jujubes raised in Clarksville, Missouri, by a former trustee of the Garden, the late Eugene Pettus, about ten years ago. In the Orient there are other species of jujubes; both sour and sweet varieties are known and the best of them are high quality dessert fruits.

This particular tree has a somewhat exotic look in the edge of downtown St. Louis. It has the general appearance of something from the hot-dry Tropics. The shiny little leaves are borne on clustered branches, from stout arching twigs.

E.A., G.H.P.

THE TRUE *SALVIA COCCINEA*, INDIAN FIRE

Before sending it in to the Fall Harvest show for exhibit, Mrs. Charles Marcrander of Kirkwood brought this brilliant and charming Salvia in to the Garden for identification. The Marcranders became acquainted with this species about five years ago when visiting friends in Clearwater, Florida, and brought home seeds from which they have successfully grown it ever since. It has long been known to science and was named by Linnaeus two hundred years ago but in the trade it has been extensively confused with the common Scarlet Sage. According to L. H. Bailey much of what has been sold and raised under the name of *Salvia coccinea* rightly belonged under *Salvia splendens.*

It is not at all strange that the Marcranders should have met with *Salvia coccinea* in Florida. It is wild there as well as cultivated in gardens. It extends from South Carolina to Texas and then southwards into Latin America. According to Caroline Dorman in her *Flowers Native to the Deep South* (Claitor's Book Store, Baton Rouge 2, Louisiana. 1958), it is one of those treasured plants which can be found in flower from spring until fall. In addition to a short note about it she has an effective color plate of a young spray of it in bloom. She gives "Indian Fire" as a common name. The Marcranders, never having heard one, have fallen into the habit of calling it "Florida Salvia." It is by such means that common names get started.

Compared to the common scarlet sage, *Salvia coccinea* is more graceful, with slightly smaller, more openly spaced blossoms on slender branching wands. The leaves and flowers have a faint but pleasant odor. The attractive leaves are borne on long slender stalks; the leaf blade itself is sharply triangular to a slender heart shape with neat inconspicuous scallops all the way around the edge. According to the books the flowers are three-quarters of an inch to an inch in length. The Marcranders must have a particularly fine strain since a good many of their flowers are up to an inch and a quarter long. It has a long narrow tube and the lower lip is twice as long as the upper. In color it is a pure, glowing scarlet; in bright sunshine the flower seems to glow as if some of the light were originating within the blossom itself. The color is enhanced by hairs of the same color on the outside of the corolla, too small to be seen as hairs by any but the sharpest eyes.

The hairs of the stems and leaves vary somewhat with different strains; in this one from Florida the upper stems and the lower sides of the leaves are clothed with almost invisible short hairs which curve downwards; the lower stem has long delicate hairs which stand out away from the stem.

Salvia coccinea seems to have been designed for enjoying in one's own garden. Sprays of it picked and carried elsewhere lose all their flowers on the way. Yet the buds remain and if the branches are put in water they will come into bloom very satisfactorily and keep on blossoming almost as if they were on the original plant. Sharp rains, strong winds, and spraying with the garden hose will also bring down a shower of scarlet blossoms, but recovery is rapid.

In Kirkwood the Marcranders save their own seed and start it on the window sill, setting plants outdoors when danger of frost is past. Some plants are potted up and kept in cold frames and then set out in order to get earlier blooms. They begin to flower when they are 6 to 8 inches high and blossom all summer and up to frost. Plants protected by the house and garage will withstand the "first white frost" and keep on blooming.

By the end of the season the oldest plants will be three to four feet high. The original central wands will have gone to seed, turned brown and been either pinched off or allowed to wither and drop off. Self-sown seedlings of the same year will be up to one and a half to two feet high by September, and will have increased the display since late summer. Branches come out from farther down the plant and rebranch so that bloom is continuous and increases as the season goes on.

In Kirkwood *Salvia coccinea* has been outstandingly attractive to humming birds. By early September as many as seven or eight of them would be around the flowers almost continuously, gathering the nectar and fighting off each other.

While *Salvia coccinea* is not as easy to raise in the St. Louis area as it is in Florida (nor in bloom here for as many months) it undoubtedly will be of interest to other gardeners.

Edgar Anderson

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HOW TO REACH THE GARDEN BY AUTO

Coming in from the West, North, or South most routes will bring you sooner or later to Kingshighway. The most direct route to the Garden is then via Shaw and Tower Grove Avenues. From the South this is a simple right turn at a stop-light. If one is coming down Kingshighway from the North this requires a left turn onto Shaw which is forbidden during rush hour traffic in the morning and the evening. However it is possible to get from Kingshighway to Shaw quite easily even during these times. Coming from the North keep to the right edge of the highway while crossing Shaw (which jogs to the South at this intersection). This will conduct you into a one-way lane between Sala's Restaurant on the right and the Viaduct, rising steeply at your left. Immediately in front of Sala's Restaurant, at what is theoretically the corner of Kingshighway and Daggett, turn left under the Viaduct to a similar lane on the other side.

There is plenty of room for this manuver but there are enough tall concrete pillars to steer between so that one has the impression of driving under a gate-leg table. A stop-and-go light on the right regulates one's reentry into Kingshighway headed North. Almost immediately one turns right onto Shaw. Though this seems complicated the first time one tries it, it is safe, simple and expeditious. On the average it takes less time than waiting for the green-arrow-left-turn which is available at other times of day.

As one approaches Tower Grove Avenue (the second stop-and-go light) the old stone wall built in Mr. Shaw's time, becomes apparent at the right. The Garden's long frontage on this avenue usually permits of parking somewhere along it and one may enter either by the Main Gate at Flora Place, or the small Cleveland Avenue Gate opposite the end of Cleveland Avenue.

PITZMAN SUMMER NATURE PROGRAM — 1963

The 1963 Pitzman Nature Program for children was the largest since the program was first offered in 1958. A record number of 438 children received certificates for attending a specified number of classes. Such a program has been made possible through six yearly grants from the Pitzman Foundation.

A major change in the program this year was the offering of classes on two extra days each week in both 5-week sessions. The new Wednesday and Friday classes were identical to those given on Tuesdays and Thursdays with the exception of the new course in plant families.

Some of the group activities offered in the program are worth mentioning. In Trailfinders, the class on trees, plaster casts of leaves were made by the children. Supervising this activity was something akin to umpiring a pie-throwing contest, but the results were gratifying. We also taught the children how to measure the heights of trees using only a yard stick. In addition to leaf collections and making leaf prints, lessons in forest community structure and geography were given. The Plant Families class introduced children to the notion that living things bore certain relationships to one another. Take the Pink Family for example. There was enough flowering material in this group so that every child could be given fresh blossoms of a number of genera such as *Dianthus*, *Silene*, and *Lychnis*. The salient features of the family were discussed, as well as the distinction of one genus from another, and the flowers were pressed by children for their collections. Whenever possible, the children were allowed to collect their own flowers. Classes in Plants and Man dealt with botanical subjects such as pollination (a vastly more interesting subject than the category to which it is usually relegated), cell structure and division, and life histories and habits of various plant groups such as mosses, ferns and fungi. Activities included making terraria, mounting plant specimens to take home, and a trip to the Climatron. In Man's Enemies, insect collecting was the main activity *after* the nets were made. Some of the 7 and 8 year olds can really make a tangle with a darning needle, a few feet of thread, and a piece of cheesecloth. Some 360 yards of material was used for the nets. Another feature of Man's Enemies was that poisonous plants such as poison ivy and oleander were pointed out and discussed.

The activities in all the summer programs each year are basically the same but are improved upon and vary in manner of presentation because of the interesting young people who join the summer teaching staff each year. Teaching the first time this year were Fred Bardenheier, a high school student, who has participated in the Garden's nature program for 6 years; Doris Forst, a student at Washington University; and Nancy Keller, a student at the University of Missouri. Teaching from previous years were

Jean Bardenheier and Isabella Powell. Since classes were given on 4 out of 5 week days, the Junior Research Teams were limited in number. Marcia Eickmeier, a student of the University of Missouri, directed these activities which covered subjects ranging from pollination and seed dispersal to exacting identification of all the species of oaks in the Garden.

Teaching is only part of the work involved in giving a program such as this. Although much of the preparation for these classes can be accomplished beforehand, a sizable amount of work is necessary behind and on the scene during the program to make it successful. Much of this work was performed by a number of willing young people, most of whom have participated in the Garden's classes for several years. They were Bill Eickmeier, Alan Meyers, Barney O'Meara, and Veronica Friel.

Informative sessions of bird study were generously provided by enthusiastic members of the St. Louis Audubon Society. In close cooperation with the Garden, Mr. Earl Hath, president of the St. Louis group, outlined the class on Birds with the people who had offered to give the course. These people were Mr. Michael Flieg, Mrs. Cecil Criger and Mrs. R. K. Kirkpatrick, and Misses Lois Wamhoff, Sarah Owen, Mariam Dryden, and Jeanne Mullgardt. The bird classes featured bird identification walks, illustrated talks, guest speakers, and many fine pointers on how to house and feed birds.

Each five-week session was ended by a rigorous treasure hunt in which the children were to find things, the knowledge of which was acquired during their activities in the program. Competition was keen among the youngest children. The winning teams received various potted plants as prizes. Prizes were also given to youngsters who had assembled the best nature notebooks and insect collections. Quite a number of children entered their insect collections in the Fall Harvest Show competition and were awarded ribbons of various degrees for their efforts.

Each year, the Pitzman Nature Program becomes a more elaborate affair. The number of people needed to manage a growing number of children increases almost every year. This, it is hoped, is a sign of successful dealing with hundreds of children to whom we strive to impart an early concept of the biological aspects of life.

KENNETH PECK

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Dr. and Mrs. John W. Seddon, Dr. and Mrs. Robert W. Kelley, and their families picnicking beneath the bald cypresses at the Friends of the Garden Picnic.

PHOTO COURTESY OF THE POST-DISPATCH.

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FRIENDS OF THE GARDEN PICNIC

THE picnic for members of Friends of the Garden and their families at the Garden's Arboretum at Gray Summit, Missouri, took place according to schedule on Sunday, October 6th. Just a few short of five hundred took part, many of them whole families with children or grandchildren. It was a bright clear day, cool in the early morning and late afternoon, hot but not at all muggy in the middle of the day. There was a pleasant, but dry, breeze and an almost complete absence of ticks, chiggers, mosquitoes and flies.

Members parked their cars at the Main Gate of the Arboretum and then took shuttle buses, which ran every few minutes, making a circuit of the main road around the Arboretum.

Quite a number went fishing, and fish were caught including at least one large one.

In spite of the severe drought and the lateness of the season, the native vegetation was surprisingly attractive. Several kinds of Asters were still flowering and on one of the nature walks, a native orchid, Ladies' Tresses, was found in bloom. The morning bird walk conducted by Earl Hath of the Audubon Society turned up several interesting things including the Red-breasted Nuthatch. Generally speaking the Nature Walks taken before lunch while it was somewhat coolish were quite extensive rambles, while those in the afternoon included informal lectures to small groups sitting in the shade and the breeze and out of the sun.

Members were free to picnic or wander wherever they wished; most of them gathered either in the breezy trail house at the upper end of the wild flower reservation or in the shade of the Bald Cypresses near the Pinetum Lake, where beverages were provided to accompany the picnic lunches which had been brought along.

It was a day for renewing old friendships and making new ones.

Kevin Blase and Peter McPheeters fishing in the Pinetum Lake at the Friends of the Garden Picnic.

PHOTO COURTESY OF THE POST-DISPATCH.

A botany lesson in the field from Dr. Anderson at the Friends of the Garden Picnic.

PHOTO COURTESY OF THE POST-DISPATCH.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 5:00 P. M., Friday through Sunday 9:00 A. M. to 9:00 P. M. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.